UNIVERSITY OF PENNSYLVANIA

WINDSTORM INSURANCE

(A Survey of the Nature, Development and Present Status of the Coverage of Losses on Land Due to Windstorms)

CHESTER A. KLINE

A THESIS

IN ECONOMICS

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

PHILADELPHIA
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PREFACE

The United States with its broad expanse of territory and peculiar topography is subject more than is any other large country to loss due to windstorms. Single storms often destroy millions of dollars in property values. Losses each year for the country as a whole are of considerable proportions. Insurance protection has been provided against this type of loss for a number of years but not until the last fifteen years has it become an important "side line." The peculiar nature of the risk and the many problems to which it gives rise have hindered to a great extent the development of windstorm insurance.

The growth of the country has been an important factor in the development of the business during recent years. In certain sections of the country property values exposed to the hazard have increased greatly. Recent disastrous storms such as the Florida hurricanes of 1926 and 1928, and the St. Louis tornado of September, 1927, have served to heighten the interest of the insuring public in windstorm insurance. In addition to the demands of individuals, such protection is now commonly required by mortgage companies, building and loan associations, and other financing institutions. In certain areas the business is regarded as of the same importance as fire insurance. New capital, before it is invested, often demands windstorm loss protection. Premiums from the windstorm insurance business collected by stock companies in 1930 amounted to more than $44,000,000. The increased importance of the business has called attention to the problems in the field and the need for an adequate survey of accumulated underwriting experience. It is the purpose of this thesis to present such a survey of windstorm insurance and to analyze its development; to present the problems which require solution and to point out their solution as far as possible. No adequate analysis of the field has been made to date although its importance has been recognized for some time. Many articles are available but they generally deal either with some spectacular storm that has occurred or with instructions to those in the business as to how it should be conducted and volume increased.

The first chapter treats the windstorm hazard. Most of the problems of the windstorm insurance business revolve about this

subject. Few persons understand the exact nature of windstorms and their importance from the viewpoint of insurance. Chapter one contains a complete picture of the windstorm hazard in the United States. It shows the nature of the different destructive winds and their importance from the standpoint of frequency, severity, and location. The reading of the other chapters will emphasize more fully their dependence upon this chapter. Chapter two is devoted to a history of windstorm insurance and its present status. The third chapter analyzes the policy forms now in use. Prevention of windstorm loss is given a separate chapter for extended treatment because of the many different opinions, and lack of opinions, regarding the value of preventive efforts. This chapter satisfies a real need of the business. Chapter five is a discussion of rates and rate-making considerations. The last chapter summarizes the most important of the windstorm insurance problems. Suggestions regarding their solution are given whenever this is possible. Conclusions regarding the future of the business are at the end.

The author desires to express his appreciation to all of those who so generously answered his numerous requests for information. He is especially indebted to many of the underwriters' associations or rating bureaus, the various state insurance departments, and to many insurance company officials, agents and brokers. Acknowledgment is due also to Dr. S. S. Huebner, Dr. C. K. Knight, Dr. H. J. Loman, and Dr. C. A. Kulp, Professors of Insurance at the University of Pennsylvania; to Mr. John Kramer, Vice-President of the Insurance Company of North America, and to Mr. C. R. Street, Vice-President of the Great American Insurance Company and formerly President of the Western Underwriters Association, all of whom read the manuscript and offered many valuable criticisms and suggestions.

C. A. KLINE.

Philadelphia, Pa.,
June, 1931.

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Introduction

Importance of the Windstorm Hazard

In this study of windstorm insurance it is necessary to turn first to an investigation of the windstorm hazard. Without a knowledge of the hazard, the subjects of rates, prevention, and the policies with their many exceptions cannot be understood fully. An insurance rate should measure the frequency and severity of the hazard at the place where the risk is located. A knowledge of the frequency, severity and place of occurrence of the different destructive winds, therefore, will facilitate rate making in windstorm insurance. Since windstorms are of different kinds, and since no control over their occurrence is possible, an inquiry into their nature should yield valuable conclusions regarding loss prevention efforts. Finally, a windstorm insurance policy is a contract, the terms of which state that the company will reimburse the insured for loss suffered as a result of windstorms, subject, however, to numerous stipulations and conditions. An explanation and criticism of the provisions of the policy cannot be given unless the hazard be defined clearly.[1]

Difficulties Encountered in a Study of the Windstorm Hazard

An investigation of the windstorm hazard from the insurance viewpoint presents some difficulties. Current literature treating the hazard consists of two kinds: first, folders and pamphlets issued by insurance companies, and articles and news items in insurance periodicals; second, articles and monographs treating the different types of destructive winds, written by meteorologists,[2] most of which are published in government publications and scientific journals. An examination of the former reveals that they are devoted almost entirely to sales arguments and fragmentary accounts of storms which have occurred from time to time. At the most, definitions of storms are given. Many

[1] Separate chapters are devoted to rates, prevention, and the policy contract.
[2] For a definition of meteorology see footnote 4.

contain statements of a general nature which, instead of shedding light upon the subject, merely serve to perplex the investigator. The latter or the technical material is deficient in several respects.[3] It is widely scattered. Most of it is either in the form of bulletins, or in the monthly and annual reports of the United States Weather Bureau. Much material can be found about certain subjects and little or none relating to others. In many cases, the meteorologists in their writings have assumed a certain amount of meteorological knowledge on the part of the reader.

Importance of the Theory Underlying the Hazard

The above difficulties were encountered in this investigation. In fact, it was not until standard texts on meteorology were digested that many questions were answered.[4] The texts supplied the theory and some facts. With the theory of the nature and occurrence of windstorms in mind, it was then possible to collect and consolidate existing information in a way which shows clearly the importance of the hazard in each of the states. This has been done in the first chapter.

Interpretation of the first chaper is difficult, however, unless the reader has a knowledge of the theory which could not conveniently be included therein. In view of the inconvenience which many readers would experience in obtaining the desired information, several pages have been devoted to a summary of the material needed. It is suggested, therefore, to the reader who wishes to go into the subject thoroughly, and who does not understand the theory, that he read Appendix A entitled, "The General Wind Circulation of the Earth."

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[3] The above deficiencies are probably not as apparent to the meteorologists as they are to one investigating the hazard in connection with insurance. The material referred to was written by meteorologists for those interested in meteorology.

[4] Meteorology is the science which treats atmospheric phenomena of all kinds. Wind is but one of the meteorological elements which determine the condition of the atmosphere at any time. See p. 52.

I

The Windstorm Hazard

The winds of the earth may be divided into two broad groups: those which are either beneficial or not hostile to man and those which, due to their velocity, cause damage to life and property. In the first group will be found the primary or general winds of the earth.[1] These winds perform important services, as for example, the distribution of moisture which results in rainfall.[2] In the second group are the destructive winds, properly called *windstorms*. These are the irregular and unlooked for winds. They comprise the secondary circulation of the atmosphere. It is of this class of winds that this chapter treats.

Definitions

Windstorm is a broad term. Correctly speaking, it includes the high winds which attend all of the so-called storms, namely, the extra-tropical cyclone, the tropical cyclone, the thunderstorm, and the tornado. The term *storm* strictly construed, relates to the cyclonic or circular movement of air about an area of low pressure, the whole of which covers thousands of square miles and is moving forward at a moderate rate of speed.[3] Meteorologists frequently use the word storm to include the thunderstorm and the tornado.[4] It is in this latter sense that the word will be used in this thesis. The word *cyclone* will be used where the more restricted meaning is desired.

These definitions, however, are not in universal use. In com-

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[1] See appendix A.

[2] For an enumeration of the services of winds see Salisbury, Barrows and Towers, *Elements of Geography*, Henry Holt and Co., N. Y., 1912, p. 111.

[3] *Weather Forecasting in the United States*, Weather Bureau, D. C., 1916, p. 349. Full descriptions of these storms appear later in this chapter. It is impossible (and not necessary here) to explain clearly the nature of each storm type in a brief definition. This fact probably explains to a large extent the persistent misuse of the names of storms by the average person.

[4] Milham, W. I., *Meteorology*, MacMillan Co., New York, 1917, p. 182.

mon use in the United States, a *windstorm* is any storm characterized by a high wind with little or no precipitation.[5] The word *storm* unless specifically qualified, includes all disturbances of the atmosphere attended by wind, rain, snow, hail, sleet, thunder, or lightning. Also a heavy fall of rain, snow, or hail.[5] Sometimes the word *storm* is used in its correct sense as a synonym for cyclone.

Further confusion exists because of the incorrect use of the terms *cyclone* and *tornado*. These words are often used interchangeably or sometimes in a sense which is entirely foreign to the nature of either. A cyclone is a *storm* under the strict definition of that term. It is an area of low pressure covering thousands of square miles about which the wind moves in a circular fashion. A *tornado* is an extremely violent storm covering a small area. The winds move in whirlwind fashion as the storm travels along its narrow path. Popular misuse of these terms caused the National Geographic Society in November 1927, to issue a special bulletin with definitions of destructive winds of all kinds.[6]

This lack of uniformity in the use of terms has been carried into the field of insurance. The term *tornado insurance*, although inaccurate because it is much too narrow, is still used more than any other. Most State Insurance reports and many writers still cling to this term. Continued use of this designation is due to the spectacular nature of the tornado, and the fact that the early policies, first sold in tornado territory, were designed and named after the dominant hazard.[7] *Cyclone insurance* is in use in some parts of the country, especially among the mutual companies of the Middle West.[8] The trend, however, seems to be toward the use of the name *windstorm insurance*. This designation, while it has some objections, is correct in that it includes all the destructive winds which cause damage

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[5] Webster's New International Dictionary, 1927; Webster's Inter-Collegiate Dictionary, Third Edition.

[6] *New York Times*, November 18, 1927.

[7] See p. 56.

[8] See the index of any Middle Western State Insurance Report for the names of cyclone companies.

to property.[9] It is now in frequent use and will, no doubt, supersede the other terms as time goes on.

In view of the conditions just mentioned and for other reasons,[10] this chapter is devoted to an explanation of the nature of the windstorm hazard. The first part is devoted to an explanation of the characteristics, origin, frequency, and severity of destructive winds occurring in the United States. In the last part of the chapter, the insurability of the hazard is discussed.

Destructive Winds Affecting the United States

The continental United States is visited by more destructive winds than is any other large country. So numerous are the storms and so destructive is their nature that the country has been called a battleground for violent storm winds of all kinds.[11]

The prevalence of destructive winds in the United States is due largely to its location and topography.[12] Located in the North Temperate Zone, most of the country is subject to the prevailing westerly winds which are more invaded by storms than any of the other permanent winds of the earth.[13] The topography must be considered, however, in order to explain fully the occurrence of numerous and severe storms of a local nature. The chief factors are the Rocky Mountains and the Gulf of Mexico. In the United States the Rocky Mountain chain runs north and south over most of its western half. Placed in this way, the

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[9] The term is vague, however, because it does not name any particular kind of windstorm. Some have objected to its use on this ground, feeling that better sales results can be obtained by stressing the dominant type of windstorm in each particular area of the country. It has been suggested that the coverage be advertised as tornado insurance in the tornado area, as hurricane insurance in the hurricane zone, and as windstorm insurance elsewhere. (Frederick Hoadley, Sec., American Insurance Company, *Weekly Underwriter*, April 1928).

Criticism of this sort can be offered against most insurance coverages. For a discussion of the use of names for property insurance coverages and a suggested new classification, see Loman, H. J., *Property Insurance—How to Make It Easier Understood*, Wharton News, April, 1928.

[10] See pp. 11.

[11] Finley, John P., *Address Before the National Association of Mutual Fire Insurance Companies*, Proceedings and Papers, 33rd Annual Convention, 1928, p. 156.

[12] Finley, Lt. John P., U. S. A., *Tornadoes*, Insurance Monitor, February, 1887, p. 85.

[13] Ward, R. DeC., *Climates of the United States*, Ginn and Co., 1925, p. 148.

mountains tend to check the eastward flow of surface winds and at the same time, permit (in fact, aid) the warm air currents from the South to mix with the cold air currents from the North. Cold air meeting warm air, produces a conflict. It is through such a mixing process that storm action seems to thrive.

Classification of Winds

Meteorologists have classified winds in many ways but always with a meteorological purpose in mind.[14] In any detailed discussion of winds, convenience and clarity necessitate a classification suitable for the purpose in view. Since no classification for insurance purposes can be found, it seems best to divide all winds into the two broad groups mentioned at the beginning of this chapter, viz.: non-destructive and destructive, the distinguishing characteristic being the velocity of the winds. In the first group belong the trade winds, the prevailing westerlies, the monsoons, the land and sea breezes, and the mountain and valley breezes. The trade winds and prevailing westerlies are permanent in nature; the others are periodic in their occurrence.

The destructive winds include the high winds that accompany the storms (cyclones) which originate in the general wind system of the earth and are carried along by prevailing air currents. The following list gives the names of the important destructive winds which occur throughout the world: cyclones, tornadoes, thunderstorms, hurricanes, blizzards, northers, Texas northers, northeasters, gales, waterspouts, typhoons, sand storms, and whirlwinds of various kinds. In some cases velocities ranging over 200 miles per hour occur.

Types of Destructive Winds in the United States

Considered according to their names, several of the above mentioned winds do not occur in the United States. Considered according to type, however, it may be said that all forms are

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[14] For a number of these classifications see: Milham, W. I., *Meteorology*, MacMillan Company, 1917, p. 164; Humphreys, W. J., *Physics of the Air*, Lippincott Company, Philadelphia, 1920, p. 100; Fleming, Robins, *Wind Stresses in Buildings*, John Wiley & Sons, 1930, Chapter I.

experienced in this country. Typhoons, for example, occur in the China Sea where they are extremely destructive in nature. These storms are tropical cyclones, similar in all important respects to the hurricanes of the West Indies which frequently sweep the Southeastern Coasts of the United States. Waterspouts are tornadoes which occur over bodies of water. They are common wherever thunderstorms take place and are experienced at times near some parts of our Eastern Coasts and on the Great Lakes. Blizzards, northers and other forms of storms occur frequently in the United States.

For the sake of convenience in discussion, a more logical classification than that given above is desirable. Destructive winds in the United States fall logically into the following five classes: (a) extra-tropical cyclones and anti-cyclones; (b) tropical cyclones; (c) thunderstorms; (d) tornadoes; (e) others. The storms in this classification, with the exception of the last class, are listed in the order of size, the cyclones being the largest and the tornadoes the smallest of the storms. They will be discussed in the order given.

Extra-Tropical Cyclones and Anti-Cyclones

Characteristics

Cyclone is synonymous with *storm*.[15] On the weather map, a cyclone is a *low* and an anti-cyclone, a *high*. The average diameter of cyclones in the United States is about 1200 miles.[16] The shape of the area covered is usually oval instead of round, and the center formation has an average speed of approximately thirty miles per hour. Due to the effect of the earth's rotation, the winds in the Northern Hemisphere circulate around he center of low pressure in counter-clockwise direction.[17]

An anti-cyclone is a circular system of winds which blow around and outward from a center of high pressure. The winds

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[15] The word storm is used in a broader sense in this thesis to include tornadoes and thunderstorms. It is the cyclone that is meant, however, when meteorologists refer to storms passing over the country. (See p. 13.)

[16] Milham, W. I., *op. cit.*, p. 285.

[17] See p. 184 of appendix A.

blow in clockwise fashion in the Northern Hemisphere and the whole formation moves forward at a rate which is less, on the average, than that of cyclones.[18] The weather over the area covered by an anti-cyclone is usually calm with little or no clouds to cause precipitation. An anti-cyclone is not a storm although the word storm is sometimes used loosely to include both cyclones and anti-cyclones. Wind velocities are generally not great enough to be destructive. The size is similar to that of the cyclone. Because the characteristics are in many ways the exact opposite of the cyclone, these formations are called anti-cyclones.

With every area of low pressure there will be found an adjacent area of high pressure. Cyclones and anti-cyclones follow each other as they move along in the prevailing winds. In general, the anti-cyclone is less stable than the cyclone. It moves with less speed, follows a less well-defined course, and often stands still for several days at a time. These differences are, however, matters of degree only.

Origin

There is not unanimous agreement among meteorologists as to the exact origin of cyclones.[19] Three theories have been advanced by way of explanation.[20] One, known as the *convectional* theory, attibutes the formation of cyclones to the rising of warm, moist, heated air, in quiet areas. Another is known as the *driven eddy* theory. Here, cyclones in the general wind system, are likened to the formation of eddies produced by one stream flowing into another, or into a still body of water. A third, the *counter-current* theory, attributes cyclones to the passing in different directions, of horizontal air currents with marked differences in temperatures.

As in the case of cyclones there is much difference of opinion

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[18] Milham, W. I., *op. cit.*, p. 306. The clockwise movement of these winds is due to the effect of the earth's rotation on the winds blowing outward from the center of high pressure. See appendix A.

[19] Marvin, C. A., *Weather Forecasting in the United States*, Weather Bureau, D. C., 1916, p. 26.

[20] Bowie & Weightman, *Types of Storms and Their Average Movements Monthly Weather Review*, Supplement I, 1914.

regarding the origin of anti-cyclones. One explanation of their cause is the cyclone itself. The air arising from the center of low pressure collects at other places causing areas of high pressure. A second explanation is the congestion which occurs as the air flows from the equator to the converging meridians at the poles. The counter-current theory as applied to cyclones can also be applied to anti-cyclones. Here the area of high pressure is the result of two strong currents of air running in opposite directions at some distance above the surface of the earth.[21]

Whatever the disagreement as to the origin of extra-tropical cyclones, there is general agreement among authorities as to their nature and activity after formation. Cyclones and anti-cyclones are known to dominate the weather of the temperate zones. In the Northern Hemisphere storms are constantly travelling eastward in a great circle around the North Pole. They invade and are carried along by the prevailing westerly winds. The result is a belt of stormy weather over a large part of the Northern Hemisphere. Most of the United States is subject to the prevailing westerly winds and the accompanying cyclones and anti-cyclones which travel with them.

Regions of Occurrence in the United States

The method usually followed in describing cyclones of all kinds which affect the United States is to divide them into types and name each type after the region over which the storm first appears on the weather map. Chart No. 1[22] is for cyclones. It shows these regions together with the usual paths or tracks followed by each type of storm for the month of January. It should be noted that cyclones do not necessarily originate over the particular area after which they are named, nor do they always follow the path designated. Furthermore, each type of storm has its sub-type which differs not only as to wind and weather characteristics, but also as to the rate and direction of travel.[23]

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[21] For a more complete explanation of these theories, see Milham, *op. cit.*, pp. 312–13.
[22] From Bowie & Weightman, *op. cit.*
[23] *Ibid.*, p. 7.

Frequency

A general knowledge of the occurrence of cyclones and anti-cyclones during the course of the year is essential for a proper understanding of the windstorm hazard throughout the United States. These lows and highs pass over the country, one after the other, in an irregular manner and over irregular courses. They are the cause of our irregular and varied weather. The passage of a cyclonic disturbance and its following anti-cyclone takes from two to four days.[24] During this period there is a complete reversal of weather conditions. The passage of a cyclone and the arrival of an anti-cyclone means a change from cloudy to clear, from rain or snow to dry air, and from cold to warm weather. These changes produce in large part, the necessary meteorological conditions which lead to the formation and travel of our numerous local storms. As will be pointed out later, tornadoes and thunderstorms are intimately connected with passing cyclones and anti-cyclones.

There is a marked difference in the frequency and character of the cyclones and anti-cyclones which occur in the United States during the course of the year. The most severe cyclones occur during the winter months.[25] Summer cyclones are weak and ill-defined. The spring and the fall are transition periods.

The greater severity of winter cyclones is due to the migration of the sun.[26] The storm belt of the Northern Hemisphere is not a perfect circle nor is it stationary. During the course of the year, this belt moves north and south, following the sun with a lag. In the winter months, the sun is farthest south, and almost the entire country is subject to the influence of cyclones and anti-cyclones. The sun is weak and shines only a few hours of each day. Local conditions are of little influence on the weather. Passing cyclones are the largest, the most frequent, and move the fastest at this time of the year.

Summer appears when the northward migration of the sun carries the storm belt with it. During this season, the effect of

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[24] Ward, *op. cit.*, p. 33.
[25] Milham, *op. cit.*, pp. 304, 307.
[26] See p. 188, appendix A.

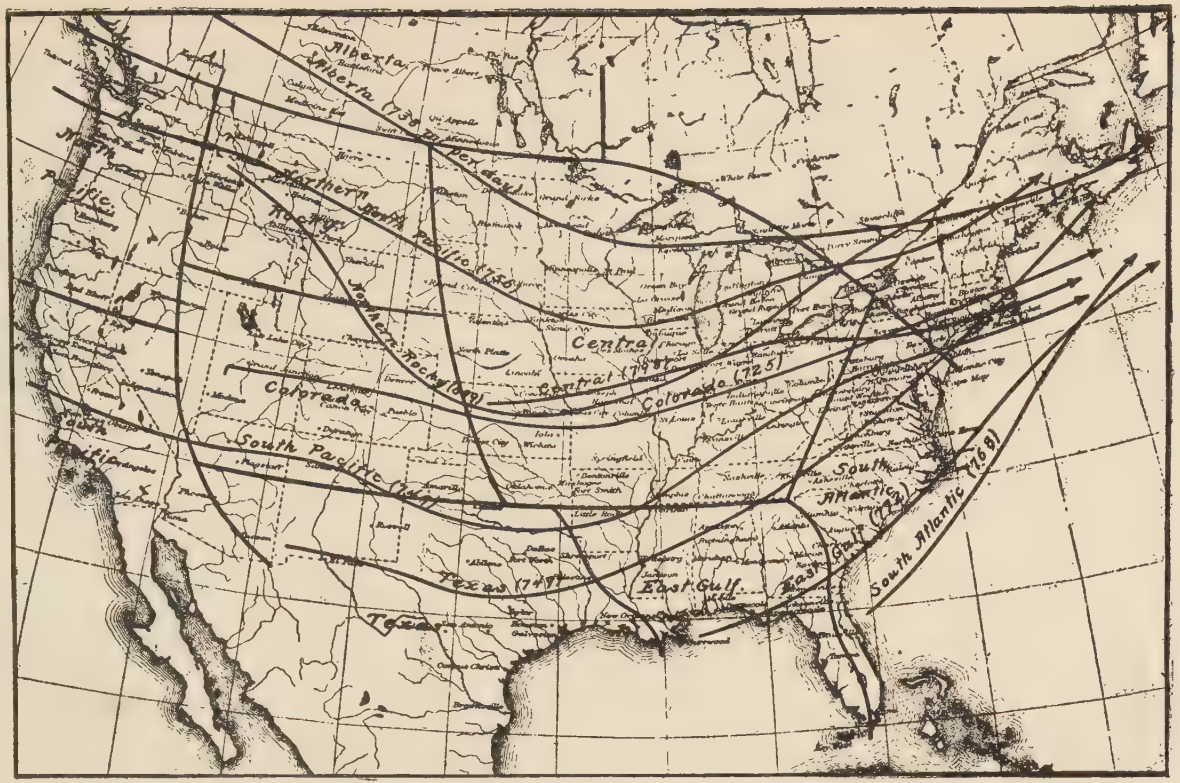

CHART I

REGIONS OF ORIGIN OF STORMS (CYCLONES) OF THE UNITED STATES AND AVERAGE JANUARY TRACK OF EACH TYPE

cyclones on the weather is less marked. Cyclones are less pronounced, ill-defined, and slower in their movements over the country. Local conditions of heat and cold are important. Thunderstorms and tornadoes are frequent and of local character. These local storms occur on the southern edge of the storm belt of the Northern Hemisphere.

On an average, twelve cyclones pass over some part of the United States during each of the months of December, January, February, and March. Travelling at a speed averaging thirty miles per hour, these formations cover about seven hundred miles per day.[27] This speed is greater than anywhere else in the world.[28] In the spring months, both the number of cyclones and their velocities decrease. During the summer, the number is still lower, averaging somewhat over eight per month. Their average speed at this time is about 25 miles per hour, or 600 miles per day. A comparison for the two extreme months of January and June shows an average of 13.3 cyclones for the former and 8.8 cyclones for the latter month.[29]

The frequency of anti-cyclones or highs is approximately that of cyclones, and their distribution throughout the months is not materially different. Their velocities are slower on the average, primarily because of their frequent stops.

Property Damage

Circulation of the wind about a cyclonic low, although in the form of an oval, appears at any one point to the observer as a straight wind. This is due to the vast area covered by the cyclone. The forward motion of the storm has no effect on wind velocities in any portion of the cyclonic area. The whole formation actually moves forward, but the winds involved at any one moment of time do not. The cyclone, as it moves forward, takes in the air at the front, uses it for a while, and then discards it.[30]

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[27] Bowie & Weightman, *op. cit.* Tables I and II (for 20-year period) pp. 7, 8.
[28] Milham, W. I., *op. cit.*, p. 305.
[29] Bowie & Weightman, *op. cit.*, Table I. Russel, Thomas, *Meteorology*, 1895, p. 153 gives fewer storms for each of the months mentioned above. Based on a 10-year period, his average for the winter months is between 6 and 7 per month; and for the summer months, between 4 and 5 per month.
[30] Milham, W. I., *op. cit.*, p. 317.

In the majority of cases, the winds of the cyclone are not to be classed as destructive.[31] In some cases, however, their velocity is great enough to be exceedingly injurious to property. If the wind velocity equals or exceeds 39 miles per hour it is called a *gale.* If it exceeds 75 miles per hour it is of *hurricane force,* although technically, it is not a hurricane.[32] Winds blowing at the rate of gale force are occasionally experienced in the lowlands of the interior. In the high mountain regions, especially those of the West, somewhat higher winds often accompany severe winter storms (cyclones). Velocities of hurricane force up to 90 miles per hour occur infrequently along the coasts of the United States.[33] Severe winter storms (cyclones) occur with wind velocities ranging from 50 to 100 miles per hour at exposed stations on the Pacific Coast north of San Francisco. Damage inland is not great.[34] Similar velocities are experienced along the Atlantic Coast.[35]

Statistics regarding property damage due to cyclones are not available in separate form. The Weather Bureau, each year in its annual report, publishes estimates of property damage due to winds other than tornadoes. Figures presented later, therefore, will include damage done by cyclonic winds as well as damage due to other kinds of winds.

Tropical Cyclones

Definition and Characteristics

Tropical cyclones occur in five different parts of the world.[36]

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[31] *Ibid.*, p. 284.

[32] As given by the Beaufort scale of wind force, and used by the Weather Bureau. For a copy of this scale see Flemings, Robins, *Wind Stresses in Buildings,* John Wiley & Sons, 1930, p. 15.

[33] Ward, *op. cit.*, p. 159.

[34] Henry, Alfred J., *The Winds of the Middle and Northern California Coast,* Monthly Weather Review, Vol. 5, No. 1, p. 3, January 1926.

[35] On January 24–25, 1928, a velocity of 72 miles per hour was recorded at New York City, and 62 miles per hour at Buffalo, N. Y. (*Climatological Data,* U. S. Dept. of Agriculture, N. Y. Section, Jan. 1928, p. 1.) These velocities were the result of a cyclonic storm over the territory extending from the Central Valley eastward to the coast and from the Chesapeake Bay to Maine. The damage to New York City alone was estimated at $500,000. (*Annual Report,* Chief of Weather Bureau, 1928–29, p. 31.)

[36] Milham, W. I., *op. cit.*, p. 274.

In all cases they originate within the tropics and have a center of low pressure about which the wind circulates with great velocity. They move forward at moderate rates of speed, ranging from 20 to 40 miles per hour. These storms are called by different names in different places. In the West Indies they are called hurricanes, in the China Sea and Japan, typhoons, and in the Philippine Islands, baguios.[37]

In many ways, the hurricane is like an extra-tropical cyclone. It differs, however, in several important particulars.[38] The area covered by the hurricane is, on the average, much smaller than that of the extra-tropical cyclone. Hurricanes range in diameter from 300 to 600 miles. The center of the hurricane has a pressure which is much lower than the center of an extra-tropical cyclone. It is more nearly round in shape. Wind velocities of hurricanes are much greater than those of cyclones, ranging well over 100 miles per hour in many storms. Torrential rains usually occur around the center of the hurricane, while in the case of the extra-tropical cyclone, rain occurs most in the southeast quadrant of the storm area.

Origin

Hurricanes originate in the doldrums near the equator, either in the vicinity of the Cape Verde Islands or in the western third of the Caribbean Sea.[39] The convectional theory of air movements,[40] together with the effect of the earth's rotation is the usual explanation given regarding their formation. It is in the warm, quiet, and moist air of the doldrums that convection is the most active. Once convection is started, the effect of the earth's rotation is to cause a counter-clock-wise motion; which in turn holds the air away from the center of the whirl by centrifugal force. The pressure of the center is by this means greatly reduced

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[37] *Ibid.*, p. 266.

[38] Humphreys, W. J., in *Weather Forecasting in the United States*, published by Weather Bureau, D. C., 1916, p. 48.

[39] Mitchell, Chas. L., *West Indian Hurricanes and Other Tropical Cyclones of the North Atlantic*, Monthly Weather Review, Supplement 24, 1924.

[40] See p. 183 of appendix A.

and this further increases the whirling motion of the air, inward and upward.[41]

Hurricanes never originate on land. If one runs ashore after formation, it weakens, loses its destructive powers, and takes on the aspects of an extra-tropical cyclone.

Regions of Occurrence

Hurricanes, like cyclones, follow courses which are fairly well defined. Their most usual path has a shape resembling a parabola.[42] Originating in the Caribbean Sea not far from the equator, these storms travel first toward the northwest and then curve to the right at about 25 to 30 degrees north latitude, continuing in a northeast direction. There are many variations, however. Some few travel almost due west, never entering the United States. Others enter the United States through the Gulf of Mexico, pass inland, take on the aspects of extra-tropical cyclones, and go far up the Mississippi Valley before turning to the right and leaving the United States by the northeastern storm route. This was the case of the famous Galveston hurricane of September, 1900. Usually, however, a turn to the right occurs much farther south. Many storms never reach any part of the continental United States because they travel more to the north and east at the start or else their origin is too far to the east to permit their path to cross any part of the country.

Chart II[43] shows the paths of four hurricanes which occurred in 1928. Three entered the United States from the southeast and then turned to the right, one storm continuing northeast over New York into the Atlantic Ocean.

Frequency

The number of hurricanes that approach close to or enter the continental United States is not greater, on the average, than four per year. Possibly it is somewhat less than this. From a purely statistical standpoint, there have been four major

[41] Milham, *op. cit.*, p. 278.
[42] *Ibid.*, p. 276.
[43] Monthly Weather Review, September, 1928.

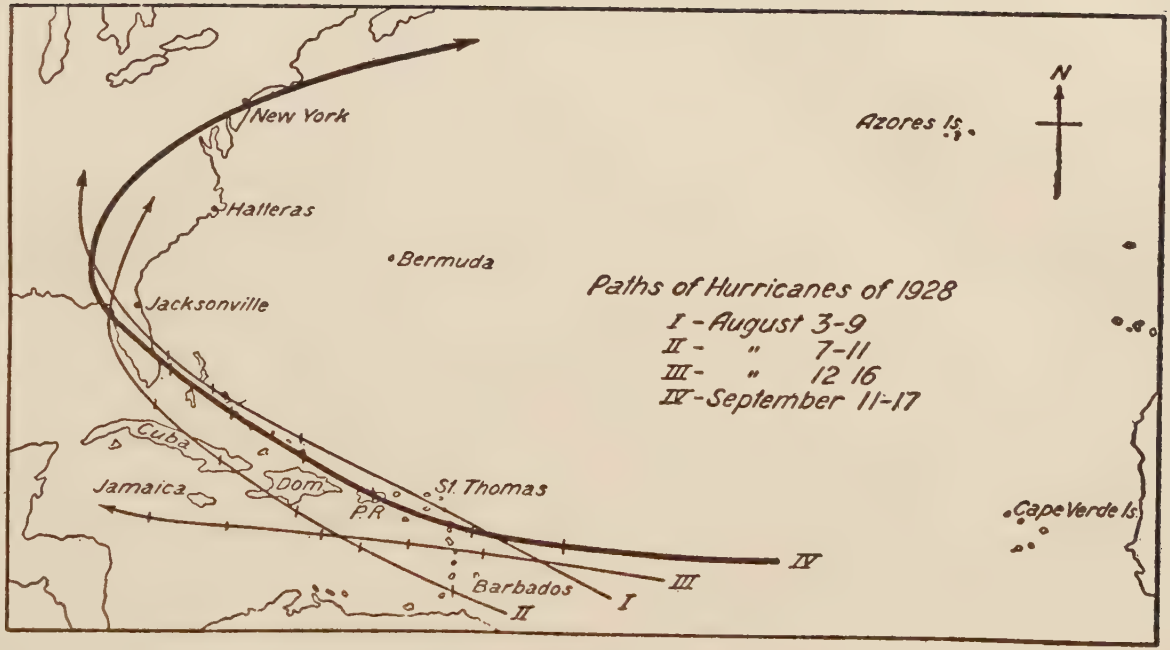

CHART II
PATHS OF HURRICANES OF 1928

compilations showing the frequency of West Indian hurricanes.[44]

The following shows a summary of the results:

	HURRICANES	PERIOD	DATES	AVERAGE PER YEAR
Garriott[45]	95	23 yrs.	1878–1900	4.1
Fassig[46]	143	36 yrs.	1876–1911	4.0
Mitchell[47]	239*	37 yrs.	1876–1911	3.3
Henry[48]	187	58 yrs.	1871–1928	3.2

* Only 122 were true hurricanes.

Even if the periods of these studies were alike, the results of the different authors would probably not be the same because of the standards set up for a hurricane by each. Henry, for example, set up three tests. The storm must have (a) a wind velocity of 60 miles per hour; (b) a minimum pressure at the center of 29.5 inches, sea level; (c) its origin below the parallel 30 degrees north latitude.

By far the greatest number of hurricanes occur during the months of July, August, September, and October. During the 58-year period from 1871 to 1928 covered by Henry, out of a total of 187 hurricanes, 11 occurred in July, 53 in August, 68 in September, and 44 in October. Of those remaining, the majority occurred in June and November.

In the same study, Henry found that the greatest number of hurricanes that occurred in any one year was 10 in 1891 and the same number in 1916. Nine occurred in 1893 and 8 in each of the years 1886 and 1887. In five years none occurred. From a monthly standpoint, 4 occurred three times during August; 3, seven times in September; and 4, once in October.[49]

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[44] Milham, *op. cit.*, p. 277, lists another compilation by Poey for the period 1493–1855, showing 355 hurricanes in the West Indies, or about one per year.

[45] Garriott, E. B., *West Indian Hurricanes*, Weather Bureau Bulletin H., Washington, D. C., 1900.

[46] Fassig, O. L., *Hurricanes of the West Indies*, Weather Bureau Bulletin X, 1919.

[47] Mitchell, C. L., *West Indian Hurricanes and Other Tropical Cyclones of the North Atlantic*, Monthly Weather Review, Supplement No. 24, 1924.

[48] Henry, A. J., *The Frequency of Tropical Cyclones (West Indian Hurricanes) That Closely Approach or Enter The United States*, Monthly Weather Review, August, 1929, p. 328. This study contains the summary shown above.

[49] See p. 34 for property damage due to all winds, except tornadoes.

Thunderstorms

Definition and Characteristics

A thunderstorm is a violent local wind action. It is characterized by a large cumulo-nimbus cloud from which rain falls freely with an out-rushing wind immediately in the front. Lightning and thunder are generally present, but the cause of the air disturbance should not be attributed to these phenomena.[50] At the time the thunderstorm approaches, there is a marked fall in the wind force, a small drop in temperature, and a continuation of the sultry and oppressive conditions that existed prior thereto. As the storm comes closer, there is a noticeable drop in temperature. From a squall cloud in the front, comes a violent outrushing wind. Then follows a downpour of rain. After an hour or so, the storm passes, the temperature rises somewhat and the wind is light and generally from the southwest or west.[51]

Hail. One-tenth to one-half of all thunderstorms are accompanied by hail. Hail occurs generally during the hot season of the year and during the hottest part of the day.[52] The hailstones are formed by the strong up currents of air. Drops of rain carried up by the wind are frozen. Falling down they get wet and are carried up again. After a number of layers of ice are thus added, the hailstones becomes too heavy to be carried up again and they fall to the ground.

Origin

All thunderstorms are caused by instability of the atmosphere. In every case there is warm moist air which rises, cools because of expansion, and in reaching the dew point, forms the large cumulo-nimbus cloud, from which rain later falls. Convection is, therefore, the cause of most thunderstorms.[53]

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[50] Milham, W. I., *op. cit.*, p. 335.
[51] *Ibid.*, pp. 321–322.
[52] *Ibid.*, p. 333.
[53] Kincer, J. B., *Atlas of American Agriculture*, Part II, Section A, Dept. of Agriculture, Weather Bureau, 1922.

A classification of thunderstorms is sometimes made[54] on the basis of the factors which bring about their occurrence. On this basis there are three classes: (1) heat or convection-caused thunderstorms, (2) cyclonic-caused thunderstorms, and (3) thunderstorms due to local conditions. In the first, or convection-caused thunderstorms, any locality which supplies the proper conditions will experience a thunderstorm as a result. Thunderstorms in this class occur usually in the southern quadrants of a *low* because here are found the warm moist winds brought by southerly winds of the cyclone.[55] In the second class, the proper conditions are due to the passing of a low and the arrival of a subsequent high. The warm air left by the southerly winds of the low is suddenly replaced by the brisk cold air from the northwest which comes with the high. When this cold air overruns or underruns the warm moist air, convection takes place. Local thunderstorms are usually caused by some such condition as a mountain causing the air to rise suddenly or by the mixing of a cold dry mountain breeze with a warm moist sea breeze. The first two classes of thunderstorms are caused by convection and are the most important from the standpoint of insurance. Their violence is often great enough to cause considerable property damage.

Frequency and Regions of Occurrence

Distribution Throughout the Year. During the first three months of the year, thunderstorm activity is located in Mississippi and the nearby states. Starting in February, however, thunderstorms spread toward the southeast and occur with increased frequency in Florida. During March, thunderstorms increase toward the northeast, and by April, the thunderstorm area includes the northeastern United States and a large part of the north and west. By May the greatest number of thunderstorms occur around Tampa, Florida, with a second center of

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[54] Milham, *op. cit.*, p. 330. See Kincer, *op. cit.*, where but two classes are named. See also Henry, A. J., Monthly Weather Review, No. 3, Vol. 55, March, 1927, p. 18. He questions the possibility and utility of such distinctions being made between thunderstorms.

[55] See p. 20.

activity over the southern plain states. During June and July, an increasingly larger number of thunderstorms occur over the Rocky Mountain States with the strong secondary center moving from the lower plain states to the southern Rocky Mountain states. This distribution does not change during August and September; there is, however, a light lessening of activity at the two centers of action. During October and November the general storm area weakens and begins to assume the same distribution as in December. The center of greatest activity is again the state of Mississippi and the Mississippi Valley.

Annual Distribution. Chart III shows the average annual number of days with thunderstorms at various points[56] throughout the United States for a twenty-year period. Certain conclusions may be drawn from this chart. No part of the United States is entirely free from thunderstorms although in some sections, such as the Pacific coast, they are rare. The second least affected area includes the extreme northeastern states. The greatest center of activity is that over Tampa, Florida, where, on the average, thunderstorms occur ninety-four days of the year. There is a second center of activity over Santa Fe, New Mexico. Here an average of seventy-three occur per year.

Property Damage[57]

Thunderstorms are not all alike as to violence. Some move in tornadic fashion, last for hours, and travel across the greater part of the country before dissipating. Thunderstorms of this kind, however, are not everywhere consistently severe. Even if their intensity did not vary, their destructive effects are limited to comparatively narrow paths.[58] Other thunderstorms are mild in their effects, doing little or no damage. Some are so small

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[56] Based on reports from approximately 185 Weather Bureau Stations. Alexander, Wm. H., Monthly Weather Review, No. 841, Volume 52, No. 7, July 1924, pp. 337–343. (Charts for the years 1904–1923).

[57] For figures showing property damage see p. 34.

[58] The average life of a thunderstorm is about six hours. At its formation it is perhaps a few miles long and one or two miles wide. The size grows with movement. At the end of the storm it may be 200 miles long and 40 miles wide. See Milham, W. I., *op. cit.*, p. 328.

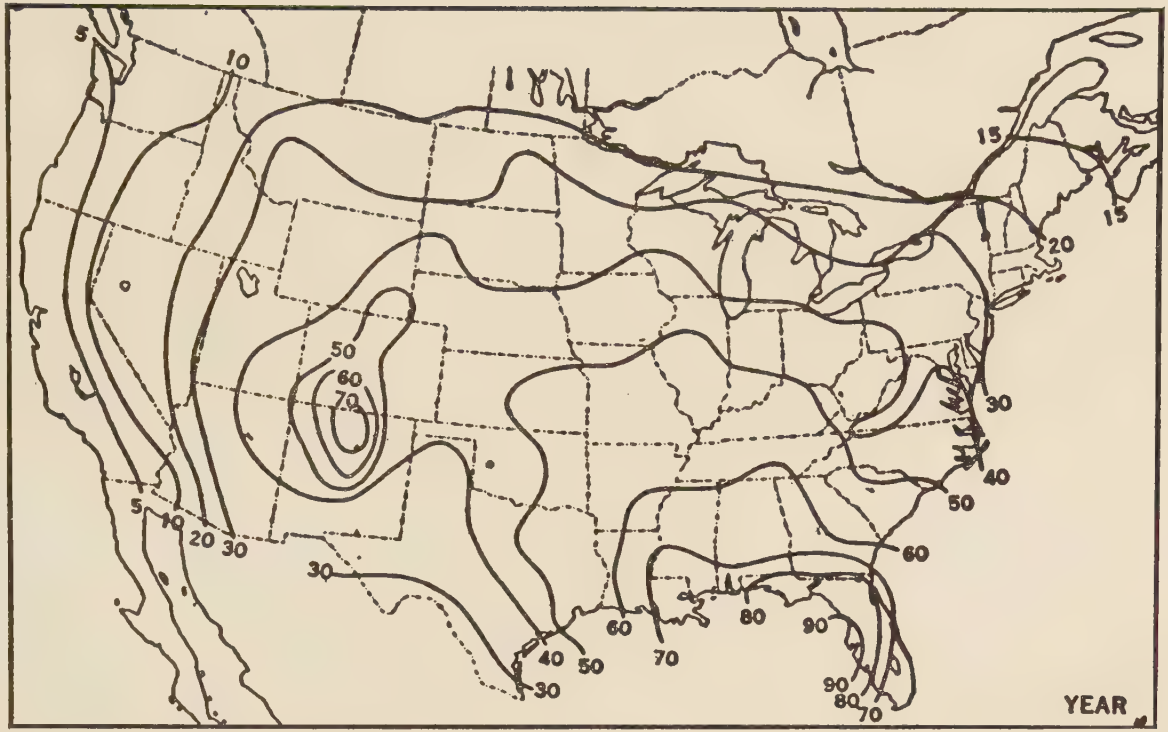

CHART III

ANNUAL NUMBER THUNDERSTORM DAYS, 20 YEARS, 1904–1923

as to occur in single counties or less area and do practically no damage.[59]

Other Winds (Not Tornadoes)

It will be sufficient here to describe briefly several kinds of winds which were mentioned previously.[60] The names of these winds are well known throughout the United States. While they are not very important from the insurance standpoint, a short description of each completes the list and, at the same time serves to make clear the nature of each.

Northers

North winds of extreme severity occur during winter over the Great Plains between Missouri and the Gulf of Mexico. In Texas, because of its nearness to the Gulf, these winds often carry rain. Here they are called wet or dry Texas Northers, depending upon the presence or absence of rain.[61]

Blizzards

There is no commonly accepted definition for this word. It originated in America,[62] and is broadly used to mean any cold wave accompanied by winds and snow.[63] The most severe form of blizzard occurs in Montana and the Dakotas[64] and it is here that the word is used in its proper sense.[65] This cold wave is the result of a dry, cold, northwest wind which appears when an area of high pressure replaces a *low*. If the arrival of the *high* brings a fine snow, an intensely cold and driving wind, it is a true blizzard.

Except in rare cases the winds of the blizzard are not destructive in the United States. Velocities of 50 miles per hour

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[59] Ward, *op. cit.*, p. 317.
[60] See p. 16.
[61] Russel, *op. cit.*, p. 115.
[62] Fleming, *op. cit.*, p. 20.
[63] Milham, *op. cit.*, p. 344.
[64] Russel, *op. cit.*, p. 115.
[65] "The true blizzard is almost unknown in the East." *Cf.* Brooks, C. F., *Why the Weather?* Harcourt, Brace & Co.. 1924, p. 231.

have been encountered for a whole day and more than 40 miles per hour for over a hundred consecutive hours.[66]

Northeaster

Often called a blizzard, a northeaster is the same type of wind as the preceding two. Strong northeast winds are usually the result of a passing cyclonic disturbance which comes up the Atlantic Coast from the South.[67] If the wind lasts for some time and is accompanied by cold and snow, it is a northeaster.

The description of these winds completes the list of destructive winds with the exception of tornadoes. It is appropriate, therefore, at this point to introduce, with comments, figures showing the amount of property damage caused by the winds discussed thus far.

Windstorm Losses, Other Than Tornado

The best source of available information for property damage due to windstorms other than tornadoes is the publications of the United States Weather Bureau.[68] Since 1916 the Bureau has been publishing each year statistics regarding windstorm losses of all kinds. Losses are divided into two groups: tornado damage and damage by all other windstorms. Table I shows losses due to those windstorms which have been discussed thus far, viz.: cyclonic winds of gale or hurricane force, hurricanes proper, thunderstorms, and straight winds called by any other name such as the blizzard and Texas Northers. The amounts stated in the table are estimates of the damage done, collected through the field service officials of the Weather Bureau. This means of collecting data accounts for the arrangement of the country into sections. With two exceptions (the combination of Maryland and Delaware and the New England States) the sec-

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[66] Russel, *op. cit.*, p. 115.

[67] The counter-clockwise motion of cyclonic winds cause the winds to blow from the northeast when the low is approaching.

[68] Reports of individual storms by newspapers and other publications are numerous, but so scattered and incomplete as to prevent their use. Furthermore, the losses reported by these agencies vary as much as 50–100 percent from the figures of the Weather Bureau.

TABLE I

LOSSES FROM WINDSTORMS, OTHER THAN TORNADOES—1916–1928*

STATE	1916	1917	1918	1919	1920	1921	1922
Alabama	4,041,000	(1)	5,000	2,000	6,150	164,400	30,500
Arizona	.....	.....	(1)	200,000	.....	(1)	250
Arkansas	(1)	4,000	.....	229,600	(1)	20,000	11,000
California	3,075,000	100,000	10,000	1,500,000	6,000	100,000	(1)
Colorado	9,050	.....	400	375	18,600	100	31,850
Florida	2,100,000	100,000	337,650	2,009,000	1,000	4,007,350	4,000
Georgia	7,000	25,000	50,000	5,000	650,000	26,000	9,000
Idaho	....	....	(1)	(1)	(1)	....	(1)
Illinois	330,000	17,300	(1)	78,125	25,000	46,200	195,750
Indiana	1,000,000	....	150	5,000	(1)	93,500	336,000
Iowa	12,200	15,000	9,000	41,000	206,350	10,000	156,500
Kansas	21,500	210,200	27,000	1,000	29,000	256,400	765,200
Kentucky	455,000	410,000	170,000	81,500	250,000	125,000	750,000
Louisiana	....	....	5,000,000	30,000	1,450,000	(1)	275,000
Maryland and Delaware	(1)	(1)	(1)	(1)	250,000	15,000	(1)
Michigan	50,600	1,300	21,000	105,060	(1)	4,000	(1)
Minnesota	60,500	(1)	(1)	(1)	(1)	(1)	(1)
Mississippi	....	500	10,000	(1)	54,000	(1)	100,000
Missouri	....	(1)	209,000	482,100	256,000	2,500	266,000
Montana	(1)	15,000	(1)	(1)	25,000	(1)	5,000
Nebraska	....	....	(1)	....	(1)	(1)	(1)
Nevada	....	....	(1)	....	(1)	(1)	(1)
New England	....	....	(1)	(1)	(1)	(1)	2,000
New Jersey	....	....	(1)	(1)	200,000	35,000	(1)
New Mexico	....	(1)	(1)	500	(1)	(1)	(1)
New York	(1)	(1)	1,005,000	(1)	50,000	2,200,000	808,000
North Carolina	14,250	(1)	(1)	(1)	(1)	(1)	(1)
North Dakota	(1)	350	52,000	(1)	18,500	600,000	(1)
Ohio	20,000	....	(1)	100,000	(1)	(1)	25,000
Oklahoma	100,000	30,000	550,000	2,500	28,000	190,000	531,500
Oregon	100	....	....	(1)	250,000	(1)	(1)
Pennsylvania	....	1,000	(1)	(1)	(1)	(1)	(1)
South Carolina	(1)	....	15,000	....	....	2,000	(1)
South Dakota	44,500	500	1,000	(1)	6,000	200,000	(1)
Tennessee	9,800	300,000	(1)	7,000	(1)	6,000	21,000
Texas	(1)	7,500	(1)	23,200,000	335,000	4,140,000	57,000
Utah	30,425	(1)	(1)	(1)	(1)	(1)	20,000
Virginia	4,600	500	(1)	5,000	5,000	6,000	50,000
Washington	145,000	(1)	(1)	(1)	200,000	(1)	(1)
West Virginia	....	....	....	10,000	(1)	11,000	(1)
Wisconsin	181,600	162,400	130,000	76,000	415,800	912,700	600,250
Wyoming	....	....	....	....	(1)	1,500	5,000
Total	11,712,125	1,400,550	7,602,200	28,170,760	4,735,400	13,174,650	5,055,800

(1) Losses occurred but cannot be estimated.

* Compiled from Annual Reports of Chief of Weather Bureau, 1916–1928, inclusive.

TABLE I (Continued)

1923	1924	1925	1926	1927	1928	TOTAL	AVERAGE
25,400	4,900	28,100	3,508,600	29,800	31,000	7,876,850	605,911
5,000	(1)	2,000	5,000	(1)	250,000	462,250	35,557
1,500	1,096,500	(1)	60,000	(1)	1,200	1,423,800	109,523
17,000	(1)	100,000	53,000	150,000	....	5,111,000	393,153
13,800	150	16,100	29,000	25,000	43,000	187,425	14,417
115,000	1,108,000	954,000	78,950,650	2,000	25,248,250	114,936,900	8,841,300
40,000	24,000	5,200	42,000	4,500	321,150	1,208,850	92,988
(1)	2,000	(1)	....	(1)	(1)	2,000	153
14,000	1,169,900	869,650	56,650	1,119,400	477,800	4,399,775	338,444
340,000	1,021,100	617,000	15,400	549,250	67,000	4,044,400	311,107
200,000	2,300,000	350,000	44,000	153,560	319,850	3,817,460	293,650
347,500	10,000	6,200	25,950	255,000	395,500	2,350,450	180,803
1,650,000	535,000	(1)	130,500	295,000	75,000	4,927,000	379,000
52,000	146,700	(1)	5,547,150	57,100	31,750	12,589,700	968,438
(1)	1,650,000	184,700	10,000	292,000	1,552,600	3,954,300	304,176
(1)	(1)	55,500	15,000	175,000	44,000	471,460	36,266
(1)	105,000	2,915,000	200	(1)	272,500	3,353,200	257,937
31,500	40,000	(1)	40,000	28,000	50,000	354,000	27,230
(1)	131,300	217,850	116,850	1,095,050	50,000	2,826,650	217,434
(1)	(1)	21,730	6,000	11,300	5,500	89,530	6,886
(1)	(1)	(1)	77,100	72,000	151,000	300,100	23,084
(1)	(1)	(1)	(1)	(1)	(1)	(1)	....
(1)	226,000	66,000	595,000	(1)	80,000	969,000	74,538
(1)	(1)	250,000	100,000	(1)	(1)	585,000	45,000
(1)	500	(1)	25,000	(1)	(1)	26,000	2,000
10,000	100,000	125,000	250,000	700,000	637,500	5,885,500	452,730
(1)	(1)	30,000	3,000	34,000	55,000	136,250	10,480
500,000	(1)	75,000	100,750	(1)	(1)	1,346,600	103,584
55,000	(1)	2,311,500	50,000	253,700	373,000	3,188,200	245,246
602,000	277,000	541,100	31,300	729,500	1,652,500	5,265,400	405,030
(1)	....	(1)	(1)	(1)	(1)	250,100	19,238
(1)	(1)	813,000	(1)	(1)	28,000	842,000	64,769
30,000	5,000	113,000	17,400	14,000	2,035,500	2,231,900	171,684
1,300	2,750,000	20,000	3,000	(1)	130,000	3,156,300	242,792
625,000	232,000	10,000	22,000	6,000	334,000	1,572,800	120,984
14,000	18,000	140,650	2,015,000	191,500	1,495,500	31,614,150	2,431,857
(1)	(1)	(1)	....	....	....	50,425	3,878
(1)	50,000	276,000	177,500	15,000	28,000	617,600	47,507
16,500	200,000	(1)	14,250	(1)	(1)	575,750	44,288
(1)	....	300,000	(1)	(1)	....	321,000	24,692
526,000	341,000	195,300	267,400	486,800	558,800	4,854,050	373,388
12,000	900	2,800	5,000	25,700	8,000	60,900	4,684
5,244,500	13,544,950	11,612,380	92,409,650	6,770,160	36,802,900	238,236,025	18,325,848

tions coincide with the state boundaries. Lightning, flood, rain, hail, sleet, and snow damages are not included in the table. Effort was made in each case to exclude all but the damage due directly to the wind.

The length of time covered by the table is sufficiently great to permit a number of important conclusions to be drawn therefrom. It should be remembered that tornado losses are not included in the table. Later, figures will be given to show tornado losses and also combined windstorm losses for the United States.[69]

(1) Total losses for the thirteen-year period amount to $238,236,025, or an average annual loss of about $18,000,000. While the total losses do not compare with fire losses of from three to four hundred million per year, nevertheless, they are important. The future growth of the country will cause increased losses of this kind.

(2) The distribution of losses varies greatly from year to year. This is true of total losses for the country as well as for total losses by states. In the year 1917 total losses amounted to less than $1,500,000; but in 1926, all losses amounted to over $92,000,000. The cause of the large losses in 1926 was mainly the severe hurricanes of that year.

(3) For most of the states, the variation in losses was as great as was that for all losses. The State of New York, for instance, which is not affected by hurricanes, had losses ranging from almost nothing in some years to $2,200,000 in 1921. Florida, however, is far above any other state from practically all viewpoints. Losses for the thirteen years amounted to $114,936,900 or about three and one-half times those of Texas, which ranked second in total losses for the period. The range of losses from year to year in Florida is remarkable. During 1920 $1000 in losses, and in 1927 $2000 in losses were estimated. In 1926, losses amounted to almost $79,000,000. This was, without doubt, the worst year for windstorm losses in the history of the state. For the thirteen-year period, Florida averaged close to $9,000,000 in losses per year.

Listed in the order of their losses for the period, the states

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[69] See pp. 44, 46.

rank as follows: (a) Florida and Texas with losses of $114,936,900 and $31,614,150 respectively; (b) Louisiana, $12,589,700; Alabama, $7,876,850; New York, $5,885,500; Oklahoma, $5,265,400; and California, $5,111,000. (c) In the states of Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Carolina, South Dakota, and Wisconsin, the losses range from $1,000,000 to $5,000,000. (d) All other states had less than $1,000,000 total losses. Idaho, Nevada, New Mexico, Wyoming, and probably most of the New England states, had negligible losses.

(4) Hurricanes evidently caused most of the losses due to straight winds. Florida and the states of the southeast had the majority of the losses. Five states, Florida, Alabama, Georgia, Louisiana, and Texas suffered approximately $168,000,000 in losses, or about 70 per cent of all the losses for the period.

Tornadoes

Most of the activity of the tornado takes place in the middle atmosphere, and often the storm touches the ground only in spots or not at all.[70] No damage is done if it does not reach the ground. At its beginning, the clouds are in a turmoil, moving and whirling about with great rapidity. From the bottom of the storm a funnel-shaped cloud develops, hangs down, and moves along in a more or less straight track. It is this pendant or funnel-shaped cloud that does great damage whenever it touches the earth. The wind blows in and around its center with velocities which have never been measured, but which are estimated by some to reach 500 miles per hour.[71] The width of the path travelled ranges between 50 to 2000 feet and the length of time it takes for the storm to pass a given point is usually but a matter of minutes. The tornado is thus the smallest and yet at the same time, the most violent of all storms. The noise which results is tremendous. During the passage of the storm there is generally partial darkness, thunder and lightning, and a downpour of rain or hail.[72]

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[70] See p. 14 for a definition of a tornado.

[71] There are numerous accounts of spectacular effect of tornadoes. Some are almost unbelievable, yet authentic records attest the facts. Most meteorological texts contain these accounts in the chapters on tornadoes.

[72] Ward, *op. cit.*, p. 344.

Origin

Originally the name was applied to a squall of great intensity and short duration occurring in front of thunderstorms on the west coast of Africa.[73] These storms were caused by convection. They lacked the severe whirling motion which is peculiar to tornadoes occurring in the United States.[74]

Nowhere else except in the United States are the conditions present for the formation of tornadoes.[75] In the regions east of the Rocky Mountains there exists an area over which the cold north winds meet and mix with the warm winds coming from the Gulf of Mexico. In this area there are provided the two elements necessary for the formation of a tornado: the presence of warm moist air in which convection takes place and strong counter-currents. The formation takes place in the following manner.[76] A tornado generally occurs in connection with and at the front of a thunderstorm. The air at the front of the thunderstorm flows inward and upward at a speed often that of a gale. When such an updraft of air meets with a strong counter-current and draws that current upward with itself, a whirling of the air results.[77] Once the whirl is started, the strong updraft due to convection maintains and increases its force, until a full-fledged tornado is developed. If the inflow of air at the bottom is checked by some obstacle such as a hill, the tornado must rise. It may, however, retain its vigor and come to the earth at another place to do great damage.

Time and Regions of Occurrence

Day. Tornadoes occur most frequently during the late afternoon hours and the least frequently during the hours of 7 to 9

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[73] Wegner, A., *Wind and Wasserhasen in Europe*, Braunschweig, 1917, quoted in Encyclopedia Brittancia, Vol. 22, 14th Edition, p. 229. See also the *Century Dictionary*, Century Dictionary Co., New York, 1911, Vol. X, p. 6391.

[74] Ward, *op. cit.*, p. 343.

[75] Tornadoes are said to occur in Western Africa, Southern Asia, and occasionally in the lower middle latitudes of Europe. Waldo, Frank, *Elementary Meteorology*, American Book Co., N. Y., 1896, p. 246. (These are tornadoes, but in greatly modified form when compared to those of the United States.)

[76] Humphreys, W. J., *The Tornado and its Cause*, Monthly Weather Review, Vol. 48, No. 4, p. 212.

[77] The basis for distinguishing between the tornado and thunderstorm is this whirling motion. Ward, *op. cit.*, p. 353.

in the morning. They usually accompany thunderstorms, and often the surrounding conditions are such as to produce more than one tornado.[78] Frequently a number occur in the same vicinity and at approximately the same time of the day.

Month. Like the thunderstorms with which they are generally associated, tornadoes occur mostly in the warmer months of the year. As the sun moves to the north in the spring, the thunderstorm area spreads to the north and west. With it goes the tornado.[79] Most tornadoes occur during the months of April, May, June, and July.[80] In a study made by Hoffman for the period 1889 to 1898, inclusive, he found that 78 per cent of the storms occurred during March, April, May, June, and July.[81] Out of 470 tornadoes, 100 or slightly over 21 per cent occurred in May. June had 86, or 18.3 per cent; April, 77 or 16.3 per cent; March, 59 or 12.5 per cent; July, 47 or 10 per cent; and August, 19 or 4 per cent. In the southern states, the tornado occurs throughout the year,[82] and the greatest frequency in these states is during the winter months.[83]

Year. Table II shows the tornado frequency by years as well as the regions of occurrence. The table is compiled from descriptions of individual storms reported each year by the Weather Bureau in its annual report. Like the previous table for other windstorm losses, the data are collected by about 5000 agents in the various sections of the country. In many cases, because of the difficulty encountered by the Bureau in determining the exact nature of the storm, judgment had to be used in classifying it as a tornado or another windstorm.

The table is interesting and the following conclusions may be drawn from it:

(1) During the thirteen-year period all but five states experienced one or more tornadoes. These five states were Maine, Rhode Island, Delaware, Nevada, and Utah. Arizona and

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[78] Thunderstorms usually occur in the southern or southeastern section of the cyclone. See page 29.
[79] Ward, *op. cit.*, p. 352.
[80] Milham, *op. cit.*, p. 340 adds the month of August.
[81] Hoffman, F. L., *Tornado Insurance*, Spectator Co., 1902, p. 12.
[82] Milham, *op. cit.*, p. 340.
[83] Hoffman, *op. cit.*, p. 16.

TABLE II

TORNADO FREQUENCY BY STATES—1916–1928*

STATE	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	TOTAL	AVERAGE
Ala.	1	4	3	2	5	7	8	1	13	5	1	1	3	54	4.1
Ariz.	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.07
Ark.	31	8	5	3	2	12	9	3	4	5	17	23	5	127	9.0
Cal.	0	0	0	0	0	1	0	0	0	2	5	0	0	8	0.6
Col.	1	0	0	0	2	1	2	1	1	1	1	0	5	15	1.1
Fla.	0	2	0	3	0	1	0	0	0	2	2	4	1	15	1.1
Ga.	0	0	0	0	1	3	0	0	11	0	0	0	7	22	1.7
Idaho	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.07
Ill.	2	4	5	9	8	4	2	4	3	4	1	18	8	63	4.8
Ind.	2	9	0	0	3	2	4	0	4	7	3	7	3	44	3.4
Iowa	8	2	11	13	7	10	9	7	6	18	6	10	45	152	11.7
Kansas	7	18	6	6	4	6	7	18	16	12	14	21	26	161	12.3
Kent.	1	4	0	0	0	2	0	1	0	7	0	0	2	17	1.3
La.	1	0	0	2	1	2	1	5	3	3	5	6	1	30	2.3
Md.-Del.	0	0	0	0	0	0	0	[1] [2]	0	0	[1] [2]	[1] [2]	[1] [2]	5	0.3
Mich.	2	4	3	1	6	2	3	2	0	3	2	5	4	37	2.8
Minn.	2	0	2	1	3	2	3	0	2	3	0	2	6	26	2.0
Miss.	8	5	1	2	5	11	9	2	8	2	2	2	2	59	4.5
Mo.	1	30	6	4	4	1	4	5	9	4	3	15	8	94	7.2
Mont.	0	0	0	1	0	0	1	8	5	0	0	2	0	17	1.3
Neb.	3	2	4	3	3	6	3	6	5	7	4	6	12	64	5.9
Nev.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Eng.	0	0	0	0	0	0	[6]	[4]	[5]	[3] [5]	[4]	[3] [5]	[6]	9	0.6
N. J.	0	0	0	0	1	1	0	0	0	0	1	0	0	3	.2
New Mex.	0	0	0	1	1	1	3	2	0	0	2	1	0	11	.8
N. Y.	0	0	2	0	1	0	3	1	1	1	1	0	1	11	.8
N. C.	1	1	1	1	2	2	2	1	4	0	1	1	2	19	1.4
N. D.	0	2	2	0	5	2	2	3	2	1	1	0	4	24	1.8
Ohio	1	3	2	0	7	3	4	2	4	2	5	4	5	42	3.2
Okla.	2	14	3	6	5	1	11	8	7	7	4	10	8	86	6.6
Oreg.	0	0	0	0	0	0	0	0	0	2	1	0	0	3	.2
Penna.	0	2	2	2	0	0	2	1	3	3	1	1	2	19	1.4
S.C.	0	2	1	2	8	2	2	1	6	2	5	1	7	39	3.0
S. D.	2	0	10	1	2	4	1	2	1	3	6	2	5	39	3.0
Tenn.	1	6	0	1	4	8	3	6	2	6	2	0	9	48	3.6
Tex.	2	4	7	9	4	13	14	8	6	6	9	25	19	126	9.6
Utah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Va.	0	1	1	0	0	1	2	1	2	0	0	1	0	9	0.6
Wash.	1	0	0	0	0	0	0	0	1	0	0	0	0	2	0.1
W. Va.	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0.1
Wisc.	1	0	3	1	1	1	3	0	6	4	2	1	9	32	2.4
Wy.	0	0	1	0	1	1	0	7	0	1	5	0	2	18	1.3
Total	83	127	81	65	96	113	118	108	136	126	115	173	213	1554	119.5

[1] District of Columbia
[2] Maryland
[3] Vermont
[4] Connecticut
[5] Massachusetts
[6] New Hampshire

* Compiled from Descriptions of Individual Storms in Annual Reports of Chief of Weather Bureau, 1916–1928, inclusive.

Idaho had but one each and property damage did not result in either case.[84]

(2) Kansas, with 161 or about 12 a year, had more tornadoes than any other state. Iowa comes next with 152 or almost as many as Kansas. Somewhat lower in the scale is Arkansas with 127, and Texas with 126. No other state had more than 100 during the period. These four states had a total of 556 tornadoes, or more than one-third of all the tornadoes which occurred.

(3) Only two states came within the 75 to 100 class. Missouri led with 94, while Oklahoma had 86. Between the 50 to 75 class, there were four: Nebraska with 64; Illinois, 63; Mississippi, 59; and Alabama 54. The following states had from 25 to 50 tornadoes during the period: Tennessee, 48; Indiana, 44; Ohio, 42; South Dakota, 39; South Carolina, 39; Michigan, 37; Wisconsin, 32; Louisiana, 30; and Minnesota, 26. Eleven of the remaining 21 states which had tornadoes, averaged less than one per year.

(4) The variation from year to year in the number of tornadoes was great. While the average for the period was about 119, only 65 occurred in 1919, and 213, in 1928.

More than the average number of tornadoes occurred during most of the later years of the period. This calls attention to the belief of many persons that the frequency of tornadoes has been increasing during recent years.[85] A comparison over a period running back to 1874 does not reveal any tendency toward an increase.[86] Moreover, the number of tornadoes that occurred in 1929 was 144,[87] or substantially less than either 1928 or 1927.

(5) The chance of any small area being struck by a tornado is very slight, even in states where the tornado frequency is great. One authority computed the tornado frequency per unit area of the different states. He found that in the most frequented areas, the probability of a tornado striking any specific area

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[84] See Table III, Tornado Losses.

[85] Reasons generally given for the supposed increase in frequency are the disappearance of forests and resulting decrease in rainfall. This belief is not new. See *Insurance Monitor*, May 1880, p. 247.

[86] *National Underwriter*, April 1, 1926, p. 29.

[87] Flora, S. D., Meteorologist, United States Weather Bureau, *Rough Notes*, February, 1930, p. 17.

CHART IV

OCCURRENCE OF TORNADOES DURING THE YEAR 1926

The arrows show location of tornado paths, and point in the direction of storm motion.

the size of one square mile was less than one-sixteenth of one per cent per century.[88]

Chart IV[89] shows the number and location of tornadoes for 1926. This year seems to be the nearest to normal of any of those on Table III.

Property Damage Due to Tornadoes

Table III shows property damage resulting from tornadoes over a thirteen-year period.[90] The following points summarize its important features:

(1) Missouri, which ranked fifth from the standpoint of tornado frequency,[91] leads the list with almost $30,000,000 in total losses. Illinois, which stood eighth in frequency had $28,453,800 in losses, or almost as much as Missouri. These two states were far ahead of the others, having losses which averaged in each case, well over $2,000,000 per year. Their losses were the highest, not so much because of the large number of tornadoes, but because the tornadoes passed over areas of great property values. One tornado, that which occurred in St. Louis on September 29th, 1927, caused damage totalling $22,000,000.[92]

(2) One other state, Indiana, had losses averaging over $1,000,000 per year.

(3) In four states, Iowa, Kansas, Minnesota, and Texas, losses averaged between $500,000 and $800,000 per year. Arkansas, Ohio, and Oklahoma had losses which averaged greater than $490,000 and should be included in this class.

(4) Alabama, Kentucky, Michigan, Mississippi, South Carolina, Nebraska, and Wisconsin had losses which averaged between $250,000 and $400,000 per year.

(5) Losses ranged from $4,500 to $250,000 in each of the following: California, Colorado, Florida, Georgia, Idaho, Louisiana, Maryland, Montana, New Hampshire, Connecticut,

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[88] Abbe, Cleveland, *Tornado Frequency Per Unit Area*, Monthly Weather Review, Volume 25 (1897) pp. 250, 251.

[89] From *Annual Report*, Chief of Weather Bureau, 1926–1927.

[90] Compiled from *Annual Reports* of Chief of Weather Bureau, 1916–1928, inclusive.

[91] See Table II p. 40. See also pp. 68, 128.

[92] *Annual Report* of Chief of Weather Bureau, 1927–1928, p. 24.

TABLE III

TORNADO LOSSES IN THE UNITED STATES—1916–1928*

STATE	1916	1917	1918	1919	1920	1921	1922
Alabama	3,500	430,000	100,000	200,700	2,155,000	756,200	140,000
Arizona	....	....	....	....	....	....	....
Arkansas	10,000	177,500	148,000	98,000	100,000	1,512,500	73,000
California	....	....	....	....	....	17,000	....
Colorado	30,000	....	....	....	....	....	130,000
Florida	....	7,000	....	31,000	....	15,000	....
Georgia	....	....	....	....	1,250,000	250,000	....
Idaho	....	....	....	....	....	....	....
Illinois	10,000	3,342,000	687,000	....	3,190,000	2,500	295,000
Indiana	....	3,000,000	....	....	3,150,000	100,000	466,000
Iowa	110,000	7,500	2,400,000	157,000	188,000	683,500	747,000
Kansas	235,000	1,870,000	2,700,000	229,000	201,000	5,000	5,000
Kentucky	30,000	2,000,000	....	....	....	50,000	....
Louisiana	40,000	....	....	45,000	....	160,000	50,000
Maryland and Delaware	....	....	....	....	....	....	....
Michigan	....	1,005,000	20,150	....	2,000,000	300,000	30,500
Minnesota	....	....	1,000,000	3,500,000	....	200,000	17,000
Mississippi	312,000	30,700	20,000	1,050,000	1,500,000	75,000	350,000
Missouri	1,000,000	1,550,000	307,000	52,000	316,000	....	177,000
Montana	....	....	....	....	....	....	....
Nebraska	20,000	....	300,000	250,000	....	....	100,000
Nevada	....	....	....	....	....	....	....
New England	....	....	....	....	....	....	10,000
New Jersey	....	....	....	....	....	....	....
New Mexico	....	....	....	....	....	....	7,000
New York	....	....	5,000	....	200,000	....	125,000
North Carolina	20,000	15,000	40,000	1,800	280,000	60,000	30,500
North Dakota	....	....	5,000	....	5,300	70,000	....
Ohio	100,000	275,000	300,000	....	1,512,000	425,000	800,000
Oklahoma	35,000	425,000	20,000	535,000	385,000	75,000	1,045,000
Oregon	....	....	....	....	....	....	....
Pennsylvania	....	....	175,000	30,000	....	....	50,000
South Carolina	....	33,000	15,000	5,500	171,000	6,200	41,000
South Dakota	206,000	....	100,000	....	....	....	175,000
Tennessee	7,500	395,000	....	8,000	33,000	211,150	218,000
Texas	25,000	200,000	510,000	668,000	79,000	742,250	959,000
Utah	....	....	....	....	....	....	....
Virginia	....	50,000	1,600	....	....	5,000	30,000
Washington	....	....	....	....	....	....	....
West Virginia	....	....	....	....	....	....	....
Wisconsin	20,000	....	715,000	500	25,000	60,000	560,000
Wyoming	....	....	1,500	....	9,500	....	....
Total	2,214,000	14,812,700	9,570,250	6,861,500	16,749,800	5,781,300	6,631,000

* Compiled from Descriptions of Individual Storms in Annual Reports of Chief of Weather Bureau, 1916–1928, inclusive.

TABLE III (Continued)

1923	1924	1925	1926	1927	1928	TOTAL	AVERAGE
12,000	317,500	295,000	25,000	....	65,000	4,499,900	346,146
....	....	....	....	....	....	.....	....
47,000	150,000	43,000	715,000	3,282,500	126,000	6,482,500	498,653
....	....	150,000	195,000	....	....	362,000	27,846
....	6,000	100,000	5,000	....	266,500	537,500	41,346
....	....	270,000	35,000	66,400	10,000	434,400	33,415
....	614,300	....	....	....	63,000	2,177,300	167,484
....	....	....	....	....	....	.....	....
10,000	86,500	13,303,000	200,000	6,069,800	1,240,000	28,435,800	2,187,369
....	33,000	3,003,300	60,000	3,264,000	82,500	13,158,800	1,012,215
95,150	88,000	2,050,000	427,000	167,900	1,970,400	9,091,450	699,342
267,000	2,134,300	367,000	161,200	1,741,750	256,900	10,173,150	782,550
....	....	1,410,000	....	....	93,500	3,583,500	275,653
965,000	100,000	5,200	214,500	160,000	12,700	1,752,400	134,800
100,000	....	....	100,000	366,000	10,000	576,000	44,307
1,000	....	275,000	40,000	235,000	80,500	3,987,150	306,703
....	500,000	137,500	....	100,500	1,190,000	6,645,000	511,153
350,000	1,010,000	250,000	60,000	20,000	....	5,027,700	386,746
101,000	304,000	571,000	268,300	24,927,000	278,800	29,852,100	2,296,315
4,000	49,500	....	....	6,000	....	59,500	4,576
32,000	..	458,000	156,000	113,100	1,826,000	3,255,100	250,392
....	....	....	....	....	....	.....	....
200,000	750,000	205,000	8,000	120,000	50,000	1,343,000	103,307
....	....	....	50,000	....	....	50,000	3,846
12,000	....	....	10,000	....	....	29,000	2,230
5,000	150,000	400,000	200,000	....	1,200	1,086,200	83,553
100,000	225,000	....	25,000	75,000	100,000	972,300	74,792
....	300,000	10,000	20,000	....	25,000	435,300	33,484
75,000	1,555,000	100,000	123,550	50,000	1,155,500	6,471,050	497,773
112,500	1,307,000	90,000	237,500	547,500	1,583,000	6,397,500	492,115
....	....	14,000	200	....	....	14,200	1,092
20,000	557,000	163,500	100,000	....	500,000	1,595,500	122,730
1,000	3,055,000	3,000	364,500	1,000	132,400	3,828,600	294,507
....	....	30,000	130,500	167,000	385,500	1,194,000	91,846
171,000	25,000	167,900	4,500	....	315,000	1,556,050	119,696
260,600	118,000	127,000	247,000	2,774,000	672,700	7,382,550	567,888
....	....	....	....	....	....	.....	....
....	31,000	....	....	325,000	....	442,600	34,046
....	250	....	....	....	....	250	19
....	....	20,000	10,000	....	....	30,000	2,307
....	1,618,000	66,500	85,000	1,200	512,500	3,663,700	281,823
14,475	....	....	11,200	....	362,000	398,675	30,667
2,955,725	15,084,350	24,084,900	4,288,950	44,580,650	13,366,600	166,981,725	12,844,748

TABLE IV

Losses Due to Windstorms of All Kinds—1916-1928*

STATE	1916	1917	1918	1919	1920	1921	1922
Alabama	4,044,500	430,000	105,000	202,700	2,161,150	920,600	170,500
Arizona	(1)	....	(2)	200,000	....	(2)	250
Arkansas	10,000	181,500	148,000	327,600	100,000	1,532,500	84,000
California	3,075,000	100,000	10,000	1,500,000	6,000	117,000	(2)
Colorado	39,050	....	400	375	18,600	100	161,850
Florida	2,100,000	107,000	337,650	2,040,000	1,000	4,022,350	4,000
Georgia	7,000	25,000	50,000	5,000	1,900,000	276,000	9,000
Idaho	(1)	....	(2)	(2)	(2)	....	(2)
Illinois	340,000	3,359,300	687,000	78,125	3,215,000	48,700	490,750
Indiana	1,000,000	3,000,000	150	5,000	3,150,000	193,500	802,000
Iowa	122,200	22,500	2,409,000	198,000	394,350	693,500	903,500
Kansas	256,500	2,080,200	2,727,000	230,000	230,000	261,400	770,200
Kentucky	485,000	2,410,000	170,000	81,500	250,000	175,000	750,000
Louisiana	40,000	....	5,000,000	75,000	1,450,000	160,000	325,000
Maryland and Delaware	(2)	(2)	(2)	(2)	250,000	15,000	(2)
Michigan	50,600	1,006,300	41,150	105,060	2,000,000	304,000	30,500
Minnesota	60,500	(2)	1,000,000	3,500,000	(1) (2)	200,000	17,000
Mississippi	312,000	31,200	30,000	1,050,000	1,554,000	75,000	450,000
Missouri	1,000,000	1,550,000	516,000	534,100	572,000	2,500	443,000
Montana	(2)	15,000	(2)	(1) (2)	25,000	(2)	5,000
Nebraska	20,000	(1)	300,000	250,000	(1) (2)	(1) (2)	100,000
Nevada	....	....	(2)	....	(2)	(2)	(2)
New England	....	....	(2)	(2)	(2)	(2)	12,000
New Jersey	....	....	(2)	(2)	200,000	35,000	(2)
New Mexico	....	(2)	(2)	500	(1) (2)	(1) (2)	7,000
New York	(2)	(2)	1,010,000	(2)	250,000	2,200,000	933,000
North Carolina	34,250	15,000	40,000	1,800	280,000	60,000	30,500
North Dakota	(2)	350	57,000	(2)	23,800	670,000	(1) (2)
Ohio	120,000	275,000	300,000	100,000	1,512,000	425,000	825,000
Oklahoma	135,000	455,000	570,000	537,500	413,000	265,000	1,576,500
Oregon	100	....	....	(2)	250,000	(2)	(2)
Pennsylvania	....	1,000	175,000	30,000	(2)	(2)	50,000
South Carolina	(2)	33,000	30,000	5,500	171,000	8,200	41,000
South Dakota	250,500	500	101,000	(1) (2)	6,000	200,000	175,000
Tennessee	17,300	695,000	(2)	15,000	33,000	217,150	239,000
Texas	25,000	207,500	510,000	23,868,000	414,000	4,882,250	1,016,000
Utah	30,425	(2)	(2)	(2)	(2)	(2)	20,000
Virginia	4,600	50,500	1,600	5,000	5,000	11,000	80,000
Washington	145,000	(2)	(2)	(2)	200,000	(2)	(2)
West Virginia	....	....	....	10,000	(2)	11,000	(2)
Wisconsin	201,600	162,400	845,000	76,500	440,800	972,700	1,160,250
Wyoming	....	....	1,500	....	9,500	1,500	5,000
Total	13,926,125	16,213,250	17,172,450	35,032,260	21,485,200	18,955,950	11,686,800

(1) One or more tornadoes occurred but no losses reported. Probably slight losses occurred in most cases.

(2) Windstorm losses (other than tornado) occurred but cannot be estimated.

* Compiled from Annual Reports of Chief of Weather Bureau, 1916–1928, inclusive.

TABLE IV (Continued)

1923	1924	1925	1926	1927	1928	TOTAL	AVERAGE
37,400	322,400	323,100	3,533,600	29,800	96,000	12,376,750	952,057
5,000	(2)	2,000	5,000	(2)	250,000	462,250	35,557
48,500	1,246,500	43,000	775,000	3,282,500	127,200	7,906,300	608,176
17,000	(2)	250,000	248,000	150,000	....	5,473,000	421,000
13,800	6,150	116,100	34,000	25,000	309,500	724,925	55,763
115,000	1,108,000	1,224,000	78,985,650	68,400	25,258,250	115,371,300	8,874,715
40,000	638,300	5,200	42,000	4,500	384,150	3,386,150	260,472
(2)	2,000	(2)	....	(2)	(2)	2,000	153
24,000	1,256,400	14,172,650	256,650	7,189,200	1,717,800	32,835,575	2,525,813
340,000	1,054,100	3,620,300	75,400	3,813,250	149,500	17,203,200	1,323,323
295,150	2,388,000	2,400,000	471,000	321,460	2,290,250	12,908,910	992,993
614,500	2,144,300	373,200	187,150	1,996,750	652,400	12,523,600	963,353
1,650,000	535,000	1,410,000	130,500	295,000	168,500	8,510,500	654,653
1,017,000	246,700	5,200	5,761,650	217,100	44,450	14,342,100	1,103,238
100,000	1,650,000	184,700	110,000	658,000	1,562,600	4,530,300	348,484
1,000	(2)	330,500	55,000	410,000	124,500	4,458,610	342,970
(2)	605,000	3,052,500	200	100,500	1,462,500	9,998,200	769,092
381,500	1,050,000	250,000	100,000	48,000	50,000	5,381,700	413,976
101,000	435,300	788,850	385,150	26,022,050	328,800	32,678,750	2,513,750
4,000	49,500	21,730	6,000	17,300	5,500	149,030	11,463
32,000	(1) (2)	458,000	233,100	185,100	1,977,000	3,555,200	273,476
(2)	(2)	(2)	(2)	(2)	(2)	.....	....
200,000	976,000	271,000	603,000	120,000	130,000	2,312,000	177,846
(2)	(2)	250,000	150,000	(2)	(2)	635,000	48,846
12,000	500	(2)	35,000	(1) (2)	(2)	55,000	4,230
15,000	250,000	525,000	450,000	700,000	638,700	6,971,700	536,284
100,000	225,000	30,000	28,000	109,000	155,000	1,108,550	85,273
500,000	300,000	85,000	120,750	(2)	25,000	1,781,900	137,069
130,000	1,555,000	2,411,500	173,550	303,700	1,528,500	9,659,250	743,019
714,500	1,584,000	631,100	268,800	1,277,000	3,235,500	11,662,900	897,146
(2)	....	14,000	200	(2)	(2)	264,300	20,330
20,000	557,000	976,500	100,000	(1) (2)	528,000	2,437,500	187,500
31,000	3,060,000	116,000	381,900	15,000	2,167,900	6,060,500	466,192
1,300	2,750,000	50,000	133,500	167,000	515,500	4,350,300	334,638
796,000	257,000	177,900	26,500	6,000	649,000	3,128,850	240,680
274,600	136,000	267,650	2,262,000	2,965,500	2,168,200	38,996,700	2,999,746
(2)	(2)	(2)	....	....	....	50,425	3,878
(1) (2)	81,000	276,000	177,500	340,000	28,000	1,060,200	81,553
16,500	200,250	(2)	14,250	(2)	(2)	576,000	44,307
(2)	....	320,000	10,000	(2)	....	351,000	27,000
526,000	1,959,000	261,800	352,400	488,000	1,071,300	8,517,750	655,210
26,475	900	2,800	16,200	25,700	370,000	459,575	35,351
8,200,225	28,629,300	35,697,280	96,698,600	51,350,810	50,169,500	405,217,750	31,170,596

Massachusetts, Vermont, New Jersey, New York, North Carolina, North Dakota, Pennsylvania, South Dakota, Tennessee, Virginia, and Wyoming. While the average losses per year in some of these states were small, large losses occurred in all states for one or more years of the period.

(6) The losses reported in New Mexico, Oregon, Washington, and West Virginia, make the hazard in these states appear small. The thirteen-year period, however, may not be sufficiently long enough to justify this conclusion.[93]

Windstorm Losses of All Kinds

Table IV shows losses in the United States due to all kinds of windstorms for a thirteen-year period. It is a combination of the losses shown in Tables No. 1 and No. 3. A number of conclusions are worthy of attention:

(1) Windstorm losses for the United States totalled more than $400,000,000 for the thirteen-year period. Losses for each year averaged more than $31,000,000. Annual losses, however, varied greatly from the average. In 1923, losses amounted to but $8,200,225 as compared with $96,698,600 for 1926.

(2) Losses varied also between the states. Florida suffered $115,371,300 wind damage during the thirteen-year period. The average for each year was $8,874,715. Texas followed Florida in losses, with a total of $38,996,700 for the period, or an average loss of close to $3,000,000 per year. Illinois suffered almost as much as Texas.

Some few states experienced little loss. Nevada had none reported although some, no doubt, occurred. Idaho had but $2,000 in losses reported for the period. Possibly one or two of the New England states had little or no loss. This cannot be told from the data as recorded.

(3) A remarkable feature about the table is the widespread losses which occurred throughout the period. Seventeen of the states on the list had reported losses during each of the thirteen years. Eleven others had losses reported during ten of the

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[93] See p. 165.

thirteen years. Only nine states had more years without reported losses than with reported losses.

(4) Table V is an arrangement of the states in the order in their respective losses. The average loss for the period is given and then broken up to show the average tornado and windstorm losses of each year.

The Insurability of the Windstorm Hazard

Kinds of Losses Which May Result

The nature of the windstorm hazard in the United States and the resulting property damage have been discussed. While the property loss is by far the most important from an insurance standpoint, other kinds of losses may result. Loss of life occurs frequently. Individual storms often cause numerous deaths. The Galveston hurricane of September 8th, 1900, which affected a large part of the southern coast of the United States, caused more than 6000 deaths on the Island of Galveston alone.[94] For the country as a whole, however, the hazard is not important enough to warrant special insurance against injury or loss of life through windstorm. Loss of life due to wind averages less than 500 per year.[95] Existing forms of life and accident coverage provide sufficient protection.

Indirect losses due to windstorms are important. Destruction of property results in many forms of business interruption losses.[96] Even the state suffers through the loss of taxes.[97]

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[94] Day, P. C., *Important Winds of the United States From an Insurance Standpoint*, Insurance Age, Volume 50, (1921) pp. 201–203. Not all these deaths were directly due to wind; many drowned.

[95] Based on the four years, 1924 to 1927, inclusive. *Insurance Almanac*, 1928, p. 1016. For a ten-year period, 1889–1898, Hoffman, *op. cit.*, p. 17, found that loss of life due to windstorms of all kinds averaged 272 annually.

[96] See pp. 107, 116.

[97] The Federal Government suffers tax losses as well as the states and municipalities. On April 18, 1929, the U. S. Board of Tax Appeals ruled that damage caused by "violent ice, sleet and windstorm" is "subject to deduction from gross income for that year . . . " See reports of above Board, Vol. 16, p. 65.

Other types of indirect loss sometimes charged to windstorms are: loss of population, withdrawal of capital from the area, and the adverse effects of storms upon the business and general efficiency of the community. No proof of such contentions are available since many other factors are present which might be the cause of the loss. For example, loss of population might be caused by the collapse of a boom period in business rather than by severe windstorms which occur at approximately the same time.

TABLE V

AVERAGE WINDSTORM LOSSES BY SECTIONS IN ORDER OF IMPORTANCE 1916–1928, INCLUSIVE

SECTION	AV. LOSS DUE TO ALL WINDS	AV. LOSS DUE TO TORNADOES	AV. LOSS DUE TO WINDS, NOT TORNADOES
Florida	8,874,715	33,415	8,841,300
Texas	2,999,746	567,888	2,431,857
Illinois	2,525,813	2,187,369	338,444
Missouri	2,513,750	2,296,315	217,434
Indiana	1,323,325	1,012,215	311,107
Louisiana	1,103,238	134,800	968,438
Iowa	992,993	699,342	293,650
Kansas	963,353	782,550	180,803
Alabama	952,057	346,146	605,911
Oklahoma	897,146	492,115	405,030
Minnesota	769,092	511,153	257,937
Ohio	743,019	497,773	245,246
Wisconsin	655,210	281,823	373,388
Kentucky	654,653	275,653	379,000
Arkansas	608,176	498,653	109,523
New York	536,284	83,553	452,730
South Carolina	466,192	294,507	171,684
California	421,000	27,846	393,153
Mississippi	413,976	386,746	27,230
Md. and Del.	348,484	44,307	304,176
Michigan	342,970	306,703	36,266
South Dakota	334,638	91,846	242,792
Nebraska	273,476	250,392	23,084
Georgia	260,472	167,484	92,988
Tennessee	240,680	119,696	120,984
Pennsylvania	187,500	122,730	64,769
New England	177,846	103,307	74,538
North Dakota	137,069	33,484	103,584
North Carolina	85,273	74,792	10,480
Virginia	81,553	34,046	47,507
Colorado	55,763	41,346	14,417
New Jersey	48,846	3,846	45,000
Washington	44,307	19	44,288
Arizona	35,557	0	35,557
Wyoming	35,351	30,667	4,684
West Virginia	27,000	2,307	24,692
Oregon	20,330	1,092	19,238
Montana	11,463	4,576	6,886
New Mexico	4,230	2,230	2,000
Utah	3,878	0	3,878
Idaho	153	0	153
Nevada	0	0	0

Peculiar Nature of the Windstorm Hazard

The windstorm hazard is peculiar from the standpoint of the lack of control that may be exercised over its occurrence. Based on their causes, all hazards may be divided into two large groups, those over which man has no control and those which may be prevented. Windstorms are perils of nature and fall within the first group.

Hazards with natural causes are numerous. In this class are found floods, earthquakes, volcanic eruptions, storms, and even day to day changes in the weather. Under no conditions is it possible, with our present state of knowledge, to exert any control over the occurrence of these events.

It is in connection with the effects of windstorms, on individuals and groups, that a second peculiarity of the hazard is apparent. All hazards with natural causes may be divided into three groups: those affecting large areas, as climatic changes, glacier or ice movements, etc.; those affecting very small areas, as lightning, hailstorms, tornadoes, volcanic eruptions, etc.; and those which may be put in either of these classes, depending upon the character of the particular event, or its place of occurrence. Examples of this last group include most of the windstorms that occur in the United States. Even the hurricane, which covers thousands of square miles, may take such a course that it will affect but a very small part of the United States.[98]

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[98] The following outline shows the complete classification referred to above. For a classification of risks upon a somewhat different basis, see Kulp, C. A., *Casualty Insurance*, Ronald Press Company, 1928, p. 5.

Hazards due to:

A. Natural Causes.
   1. Hazards affecting primarily large areas.
      (a) Climatic changes, (b) Glacier or ice movements, (c) Cyclonic winds, etc.
   2. Hazards affecting primarily small areas.
      (a) tornadoes, (b) thunderstorms, (c) hailstorms, (d) lightinng, (e) volcanic eruptions, etc.
   3. Hazards which may fall into either of the above groups, depending upon their character or place of occurrence.
      (a) earthquakes, (b) floods, (c) most windstorms.

B. Man Made Causes.
   1. Hazards arising out of associations or groups of individuals.
      (a) Political hazards: tax changes, tariffs, etc.
      (b) Social hazards: wars, revolutions, etc.

A third peculiarity of the windstorm hazard is its close relationship with other factors which make up our weather. The word weather means the condition of the atmosphere at any one place and time.[99] Six factors (meteorological elements) determine the weather: temperature, pressure, wind, moisture, clouds, and precipitation.[100] Windstorms, therefore, are but one result of the condition of the above six factors at any one time. It is because of this that windstorms are generally accompanied by one or more of the following: rain, cold, snow, frost, flood, cloudburst, overflow, and tidal waves. The last mentioned is due directly to the wind. The others arise out of the weather conditions at the time. All may assume such form as to cause loss to property. Because these conditions occur at approximately the same time, it is difficult in many cases to distinguish between the losses resulting from each. How the companies have met this problem will be discussed in the chapter on Policy Forms and Their Analysis.[101]

Need For Insurance

From what has been said, it is evident that almost all portions of the United States are subject to risk of loss by windstorms. Owners of property and others who may suffer losses, have the following three methods available for meeting the risk:[102] prevention in some form, assumption of the risk, or transferring the risk to third parties. Prevention of windstorms is impossible.[103] Assumption of the risk may be made without adequate provision

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(c) Economic hazards: changes in demand, changes in price level, etc.
2. Hazards arising from personal causes.
(a) Those affecting primarily the individual:
1. Injury to his person, death.
2. Injury to his business by fire, etc.
(b) Those affecting primarily other persons.
1. Legal liability for personal negligence.
2. Legal liability arising from business operation.

[99] Milham, *op. cit.*, p. 379.

[100] Climate is the weather summarized for a large area and period of time. *Ibid.*, p. 379.

[101] See p. 88.

[102] Heubner, S. S., *Property Insurance*, D. Appleton and Co., 1924, p. 1.

[103] See Chapter IV on prevention for an explanation of the extent to which the effects of storms may be minimized.

in the way of reserves, or by scientifically setting aside funds to meet losses. So-called self-insurance against windstorm losses, however, is difficult to carry out because of the peculiar nature of the hazard. The law of average will work only over a very large area and over a long period of years. Transferring the risk to others is not possible except by the means of insurance. This last method of meeting the risk is used more than any other.

Is the Hazard Insurable?

Any hazard to be insurable must meet certain tests.[104] The anticipated loss must be worth providing against; must not be controlled by either the insurer or insured; must occur frequently enough to allow the law of average to work; must occur to but a part of the group; must be capable of being estimated beforehand with some accuracy; and finally, the cost of providing the insurance must not be prohibitive.

The windstorm hazard meets these tests.[105] It is apparent that it is a proper subject for insurance. How the insurance is provided, the extent of the protection, and other similar matters are explained in the following chapters.

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[104] Richards, George, A., *Treatise on the Law of Insurance,* Banks Publishing Company, 1912, p. 2.

[105] For further reference to the extent to which several of these tests are met and some problems connected therewith, see the last chapter.

II

History and Present Status

Origin and Early History Up to 1880

The business of insuring against losses on land due to destructive winds is comparatively new. In its earliest form the policy contract provided for insurance *against loss by fire or storm*, a case of this kind reaching the courts in 1858.[1] Policies of this type, however, were sold only in the rural sections of Pennsylvania, especially in the territory surrounding the northern part of Philadelphia.[2] No record of these policies being sold by other than mutual companies can be found. A second case involving a policy of this type did not reach the courts until the early 80's. During this period numerous mutual companies were organized throughout the rural sections of the east and it seems safe to presume that a fairly large number of policies of this nature were sold.

The interpretation by the courts of policies of this kind is important. Many later changes in the wording of the contract were evidently the result of early court rulings. In the above mentioned case insuring *against loss by fire or storm*, the property insured was located on the Pennsylvania bank of the Delaware River. Due to rain and a warm south wind which melted the snow, the river rose to such a point that water and ice carried away part of the insured property. The court in deciding the right of the insured to recover, discussed two questions: was there a storm which might be either the proximate or remote cause of the loss, and was such a storm, if it did exist, the proximate cause

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[1] Stover v. Insurance Company, 3 Philadelphia, 38.

[2] Fowler, J. A., *History of Insurance in Philadelphia*, 1683–1882, Review Publishing and Printing Co., Philadelphia, Pa., 1888, pp. 840, 867. Mutual companies were formed in rural sections of New England and Middle Atlantic states from 1820 on. By 1850 over 100 of these companies had been organized. (See Valgren, V. N., *Farmers' Mutual Fire Insurance in the United States*, University of Chicago Press, 1924, p. 11). It is possible, therefore, that some form of windstorm protection was sold much earlier than 1858, but no record of such case can be found.

of the injury? In answering these questions, the court said: "the word *storm* does not seem to have acquired a legal sense or signification. In ascertaining its meaning, therefore, we must have recourse to the ordinary standard of definition and interpretation. . . . A word is to be taken in its plain, ordinary sense, and the popular idea of the meaning of the word *storm* is that of unusual violence and commotion of the elements, beyond an ordinary rain, or snow, or wind. . . . But let it be granted that rain combined with the south wind was a storm such as the company undertook to insure against. Unquestionably, I think the storm was only the cause of the loss which is too remote, while the immediate cause was the freshet. The loss was not proximately caused by the peril insured against."

In deciding the case in favor of the company the court definitely settled the second question relating to the proximate cause of the loss. The first question was not definitely answered. The decision, however, shows clearly that a company's liability under such an insuring clause would be determined according to the common usage of the word storm and not by any technical definition. In a later case in which a similar insuring clause was being interpreted, the court very clearly defined the company's liablility as including all damage resulting from "a violent disturbance of the atmosphere, producing wind, rain, snow, hail, or thunder and lightning; hence often a fall of rain or snow."[3] Thus, while the companies probably were not liable for losses

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[3] Tyson v. Union Mutual Fire and Storm Insurance Company, 2 Montgomery County Reporter, (Pa.), 17, (1883). In this case the court said: "What is understood by the word storm? Webster defines it as 'a violent disturbance of the atmosphere, producing wind, rain, snow, hail, or thunder and lightning; hence, often a fall of rain or snow'. In his synthesis of the word, this lexicographer says: 'Storm is a violent agitation, a commotion of the elements by wind, etc., but not necessarily implying a fall of anything from the clouds. Hence, to call a mere fall of rain without wind a storm (though common in this country), is a departure from the true sense of the word.' With these definitions of the term, I think the common usage of it among intelligent people strictly accords . . .

"In this case the facts show all the elements here required more than fulfill Webster's definition. Here was a violent disturbance of the atmosphere, wind and snow and rain. The snow fall was heavy, the wind high enough to drift it into heaps; and rain followed, soaking the snow and adding its weight, until before daylight it broke down the roofing of the shed.

"While every case of snow which causes a roof to fall would not be covered by such a policy, the above was the direct result of a storm as defined."

resulting from disturbances some distance away, they were bound to pay claims resulting from practically all disturbances of the atmosphere over the area where the insured property was located.

In the Middle West, windstorm insurance was first called *Tornado Insurance*, the coverage being named after the dominant type of windstorm in that area. The name persists, and today it is used more than any other.[4] The first reference to *Tornado Insurance* which can be found is an announcement in 1861 that a company called the *Tornado Insurance Company* was formed for the sole purpose of providing insurance against loss or damage by windstorms or tornadoes.[5] Following the formation of this company, a number of small companies of the local mutual type began to sell the coverage. By 1865 there were at least seventeen companies, all organized under the laws of one state (Iowa), writing some form of windstorm protection in connection with their fire and lightning policies.[6] While many new companies kept entering the field, there were many failures, so that at the beginning of the 80's there were between thirty and fifty companies operating in the Middle West;[7] and so far as is known, all were of the mutual type. The stock companies had not yet entered the field.[8]

Summarizing, the windstorm business for the entire country up to about 1880 may be characterized as local in nature. It was sold on rural rather than city risks, the business being conducted by the local or farmers' mutual type of company. As the Signal Service (now called the Weather Bureau) of the United States Government did not come into existence until 1870, the companies had little or no information about the hazard which could be used as a basis for premium computation. In general, their experience was unfavorable. In the East losses were great due to liberal court decisions. In the Middle West, while the policies

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[4] See page 13.

[5] Stephenson's Reporter, quoted in Insurance Monitor of 1851. Cf. Hoffman, F. L., *Windstorm and Tornado Insurance*, Spectator Company, 1902, p. 41.

[6] Simpson, Howard E., *Tornado Insurance*, Monthly Weather Review, December, 1905, p. 354.

[7] *Ibid.*, p. 535.

[8] *Letter* from Harding, J. C., Manager, Western Department, Springfield Fire and Marine Insurance Company.

were worded differently, the windstorm hazard was greater and many failures occurred due to the sweeping character of windstorm losses. The business was being conducted throughout the country on an experimental basis.[9]

The Period From 1880 to 1906

The early 80's marked the entrance of a number of large stock fire insurance companies into the windstorm business with a corresponding increase in volume and some important changes in practice. In addition, there was increased interest in the subject on the part of insurance, meteorological, and government organizations and publications.[10]

1. *Early Stock Companies in the Field*

The identity of the first stock insurance company and the date of its entrance into the field has for some time been a subject of good-natured controversy. Evidence points toward the German Insurance Company of Freeport, Illinois,[11] as the first stock insurance company to write a (so-called) tornado policy. This policy was written on the tenth of June, 1879.[12] An ordinary fire policy was used by the agent and after the word *fire* in the insuring clause, the words *lightning*, *tornadoes*, *cyclones*, and *windstorms* were added. A few policies covering only the windstorm hazard were sold.[13]

The second stock company entered the field in 1882. In this year the Springfield Fire and Marine Insurance Company issued its first tornado policy through its Western Department at Chicago by attaching a rider to the fire policy. The business

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[9] *Insurance Monitor*, July 1881, p. 339.

[10] See the *Insurance Monitor* for the years 1880 to 1885, especially the first three years.

[11] This company ceased business following the great conflagration at San Francisco.

[12] Cravens, R. P., *Letter* to The Insurance Field, September 30, 1926, pp. 8, 36. In this letter Mr. Cravens claims to have a copy of his policy register showing the record of a tornado policy sold on the above date. It is interesting to know that Mr. Cravens sold this policy as agent, without first securing permission from the German Insurance Company. During 1879, his agency collected $2,359 in premiums for tornado insurance.

[13] *Ibid.*, p. 36.

was confined chiefly to farm property and rural risks.[14] The company paid its first loss to a citizen of Iowa.[15]

Following 1882 many other stock companies entered the field. Probably the first of these was the Phenix of Brooklyn, now the Fidelity-Phenix, although this cannot be definitely determined.[16] By 1902 a total of thirty-two stock companies, four of them foreign, were engaged in the business. Some of the better known companies were: Aetna of Hartford, Agricultural of Watertown, Continental of New York, Insurance Company of North America, Merchants of Newark, Phoenix of Hartford, Queen of London, and the St. Paul Fire and Marine of St. Paul.[17]

2. *Volume of Business*

Accurate figures showing the amount of windstorm business up to 1906 are not available. Most states did not require the companies to make separate reports. As the bulk of the insurance was sold by fire and marine companies, the reports usually did not distinguish between the various coverages sold at that time. In a few states statistics are available for those companies doing nothing but a windstorm business but these are not important. In only one state, Missouri, did the law require a separate windstorm report and that was for business within the state only.[18]

Because of the above conditions the Eleventh Census of the United States is the best source of information on the subject for the years between 1879 and 1890.[19] Even these figures are not complete for the reasons just stated. It is quite possible that they understate the volume by twenty-five per cent or more.[20]

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[14] *Letter* from Harding, J. C., Manager, Western Department.

[15] *Seventy-five Years of Fire Insurance*, Springfield Fire and Marine Insurance Company, Boston, 1924, p. 120.

[16] *Letter* from Street, C. R., President, Western Underwriters Association, Chicago, Ill

[17] *Insurance Year Book*, Spectator Company, 1902, p. 250.

[18] Simpson, Howard E., *op. cit.*, p. 536.

[19] This is the only Census of the United States which includes data about insurance.

[20] This statement is based upon a comparison of the Census figures for the year 1883 with the figures for the same year published by the State of Missouri. After 1883 (which was the first report), the State of Missouri published only the amount of business done within the state. *Cf.* Hoffman, F. L., *op. cit.*, pp. 42, 46.

ELEVENTH CENSUS INSURANCE DATA

	RISKS WRITTEN	PREMIUMS RECEIVED
1880	$3,928,200	$74,702
1881	5,642,254	105,192
1882	10,665,811	191,618
1883	14,629,036	240,611
1884	17,806,024	319,753
1885	18,416,581	303,762
1886	21,390,669	306,213
1887	19,469,476	278,768
1888	20,223,327	266,884
1889	21,295,370	277,614
1880–89	$153,466,748	$2,365,117

Allowing for the greatest possible error in understatement of actual conditions, these figures show that the windstorm business had not become very important from the standpoint of volume prior to 1890. The rate of growth, however, was steady and rapid, especially from 1880 to 1887.

After 1890 the business apparently continued to grow at a steady rate, although records for each year thereafter are lacking. Hoffman[21] states that on January 1st, 1900, the incomplete returns of *The Spectator* showed $175,000,000 of insurance inforce, with $92,583,000 of insurance written or renewed during 1899. Premiums received from the insurance written during 1899 totalled $484,638. Thus during the decade, insurance in force increased over 400 per cent and premiums almost doubled. The trend was definitely toward lower premium rates.

No figures are available for the next five years, although one estimate is for $500,000 in premiums for the year 1905.[22] Many of the companies still kept their accounts in such manner as to prevent accurate determination of their experience.

3. *Methods and Practices of Underwriting*

For a very short time after they entered the field, the stock

[21] *Ibid.*, p. 49.

[22] Simpson, Howard E., *Op. cit.*, p. 539. This figure seems much too low. The Spectator Company for 1906 reports $864,354. See p. 69.

companies sold the tornado coverage by attaching a rider to the fire policy. A typical form was as follows:[23]

This Slip to Attach to and Form a Part of Policy No.....

In consideration of the payment of.....dollars extra premium, this policy to cover loss or damage by Tornado or Cyclone, under the express terms and conditions that the loss on any building must exceed fifty dollars before a claim can be made; also that hay and grain while in stack in field, not insured against Tornado and Cyclone.

The terms and conditions of this slip be null and void unless countersigned by the authorized and commissioned agent for this Company at.....

Countersigned this.....day of.....188...

.....Agent.

At first this rider seemed to meet all requirements. Soon, however, the companies felt it necessary to write the coverage under a separate contract. One reason for this was legal in nature. The attachment of a rider to the fire policy was contrary to the laws of some of the states.[24]

A second reason for a separate policy was the necessity for the inclusion of certain policy conditions which were entirely different from those contained in the fire policy with rider attached. It is interesting to note the effort of the companies during this period to construct a separate contract which would give adequate protection against windstorm damage and, at the same time, not allow the insured to recover for the many losses due to the other perils of nature. One of the earliest of separate policies, issued in 1887 by a large stock fire company, insured against *loss or damage by windstorm, cyclone or tornado.* There was no attempt to define these terms and thus protect the company against rulings similar to that handed down in the case of Tyson vs. Union Mutual Fire and Storm Insurance Company,

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[23] *Insurance Monitor*, February 1883, p. 84.

[24] The rider is in limited use at the present time. Where permitted, companies use a more complete rider than the one cited in connection with farm risks and grain when insured on the farm. See p. 81. Copies of these riders will be found in the Appendix.

which has been quoted.[25] There were, however, a list of exceptions in the policy as follows:[26]

"This company will not be liable for any loss or damage that may occur from hail or lightning or by the blowing down of chimneys, loose clapboards and shingles, unless other damage occur, nor shall this company be liable for any loss or damage that may occur to hay, straw or thatched roofs.

"This policy does not cover plate glass in doors and windows when of the dimensions of nine square feet or more, nor signs, awnings, shutters or blinds."

Exceptions of this kind, while in frequent use for the next few years, were not satisfactory. The wording was such that cases were soon brought into court for the interpretation of its provisions. In the case of Holmes vs. Phenix Insurance Company,[27] recovery by the insured depended upon the meaning of the clause, "unless other damage occur," used in the first paragraph. The insured sought recovery for damage by hail on the grounds that other damage (by wind) had occurred and, therefore, the company was liable for the entire loss. The court ruled that the words, "unless other damage occur," were restricted to that part of the sentence referring to damage from wind, and that they did not affect the clause exempting the company from liability for damage due to hail or lightning. Another interesting case arose involving one of the exceptions in the last paragraph. The insured sued to recover damage done to plate glass in his building, although such loss apparently came within the exception in the policy. The court held that a plate glass front which was immovable and stationary, though the glass therein was greater than nine square feet, was covered by the policy because the common meaning of a "window" is an opening which admits light and air; and in this case the glass admitted light but not air.[28]

In an endeavor to issue a contract which was definite in its

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[25] See p. 55.

[26] Deitch, Guilford A., *The Tornado Policy—Considered from Its Legal Aspect*, an address before the Fire Insurance Club of Chicago, February 25, 1908. Printed in Rough Notes, Volume XLI, No. 17, pp. 389–391.

[27] Holmes vs. Phenix Insurance Company, 47 L. R. A., 308.

[28] Hale vs. Springfield Fire and Marine Insurance Company, 46 Missouri (appeals) 508 (1891).

terms, the companies proceeded to change its provisions. In 1892, another large stock company began issuing policies against *loss or damage by tornado, cyclone or hurricane.* Note the exclusion of the word *windstorm* and the insertion of the word *hurricane* in its place in the insuring clause. The exceptions in this policy were:[29]

"This company shall not be liable for any loss or damage that may occur to any building in the course of construction and not completed, nor for any damage that may occur from blowing off shingles or boards not properly secured. This company shall not be liable for any loss or damage that may occur from hail, nor shall this company be liable for any loss or damage that may occur to buildings or their contents when insured with hay, straw or thatched roofs."

The wording in this case eliminated many of the defects of the first list of exceptions. It was soon found, however, that the list of exclusions was entirely too limited and the companies began to add to the exceptions. The result of these later changes and additions was the formation of the first standard contract in 1905. Other conditions existed, however, which played an important part in the adoption of a standard contract, and these should be noted here.

A comparison of the above lists of exclusions with each other and with the rider used on the fire policy shows a decided lack of uniformity. This was caused partly by a lack of the necessary cooperation among companies by which uniformity in practices could be secured. Another cause was the many different court decisions interpreting the policy provisions.[30] A final reason was the newness of the business. The period was one of competition and change. Nevertheless, each company was striving, in spite of competition, court interpretations, and lack of windstorm experience, to obtain a contract suitable for the hazard assumed.

It was out of this unstable state of affairs that a third reason appeared for the formulation of a separate windstorm contract.

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[29] Deitch, Guilford A., *op. cit.*, p. 389.

[30] For the nature of these later decisions, see Chapter III on Policy Forms and their Analysis.

The rider was often used as a competitive weapon for obtaining business by attaching it to the fire policy without adequate premium charge therefor. This practice, together with other forms of competition, led to the formation of underwriting organizations for the regulation of the business. Naturally, the early activities of these organizations were directed towards securing uniformity and eliminating the evils of the business. A standard contract was formed, and one of the rules adopted by the underwriting organizations prohibited the use of the rider for the reason just indicated.[31] This leads to the third period in the history of the windstorm insurance business, that from 1905 to date.

The Period From 1905 to Date

1. *Uniform Policy Adopted*

Agitation for a uniform policy appeared as early as 1886.[32] Attempts to secure such a contract, however, were not successful until 1905. In June of this year a meeting of all companies writing the windstorm business was held in Chicago to consider tornado reforms and hear the report of a committee previously appointed to draft a uniform contract.[33] The outcome of this meeting was the adoption of a standard contract. Evidently no other important reforms were brought about.[34]

The standard contract as adopted insured against all direct *loss or damage by tornado, windstorm, or cyclone.* The exceptions in the policy were as follows.[35]

"This company shall not be liable for any loss or damage caused by hail, whether driven by wind or not, snow-storms, frost or cold weather, nor for the blowing down of metal smoke stacks (unless specifically insured), awnings, signs, temporary or board roof additions, nor for loss or damage to buildings

[31] *Letter* from Harding, J. C., *op. cit.*
[32] *Insurance Monitor*, February 1887, p. 79.
[33] *Weekly Underwriter*, June 10, 1905, p. 549. The name of the underwriting organization sponsoring this meeting was not given. Evidently it was the Western Union, now the Western Underwriters Association.
[34] The problems of rate and commission regulation were to be taken up at this meeting but later reports of the results do not mention these subjects.
[35] Deitch, Guilford, A., *op. cit.*, p. 390.

(or their contents) in process of construction or reconstruction, unless same are entirely enclosed and under roof, with all outside doors and windows permanently in place; nor for loss or damage occasioned directly or indirectly by or through any fire, explosion, tidal wave, lightning, high water, overflow, cloudburst; nor by theft, nor by reason of any ordinance or law regulating the construction or repair of buildings nor for consequential loss of any kind.

"This company shall not be liable for any loss or damage caused by water or rain, whether driven by wind or not, unless the building insured or containing the property insured shall first sustain an actual damage to the roof or walls of same by the direct force of the wind and shall then be liable only for such damage to the interior of the building or the insured property therein as may be caused by water or rain entering the building through openings in the roof or walls made by the direct action of the wind.

"This company shall not be liable for loss or damage to accounts, bills, money, deeds, evidences of debt, securities, bullion, manuscripts, nor, unless expressly assumed by agreement indorsed hereon, for casts, curiosities, drawing, medals, models, jewelry, patterns, pictures, scientific apparatus, sculpture, store or office fixtures."

This policy is so similar to the present standard contract that comment on the meaning of its provisions can well be deferred to a later chapter.[36]

In the East, underwriters were engaged during this same year in a like task of organizing and regulating the windstorm business.[37] In April of 1905, the eastern officials requested a conference with the western organization for the purpose of securing uniformity in forms and practices.[38] As a result of this conference, the policy adopted by the eastern underwriters was similar to that of the western organization. There was one difference of opinion, however, and that had to do with the coinsurance requirement for all risks except dwellings.

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[36] Chapter III on the Policy Forms and Their Analysis.

[37] The business in the east at this time was largely concentrated in the South Atlantic and Gulf states. It was not until 1916 that the Eastern Tornado Association was organized in the Middle Atlantic and Northeastern states. See p. 66.

[38] *Weekly Underwriter*, April 27, 1905, p. 390.

2. *Coinsurance*

The principle of coinsurance had been in use for more than ten years prior to this time, but because of lack of cooperation, it was by no means universal.[39] The present instance shows the conditions under which the windstorm business was being conducted shortly after 1905. It also illustrates well the history back of the coinsurance clause which is in use today.

In connection with the use of the above mentioned standard contracts, a controversy arose over the adoption of a coinsurance clause. Most of the western underwriters favored writing all risks without coinsurance. Several reasons were offered for this stand. They thought it would invite hostile legislation or conflict with existing state laws; that it was not needed because most of the business was sold in rural sections where, as a rule, the tornado insurance was equal to the fire coverage; and finally, that it should be made a matter of local board regulation to fit the conditions which were local in nature.[40] Eastern underwriters contended that many persons would take just enough insurance to cover small losses arising from damage to windows, roofs, chimneys, ornaments, and similar injuries to property. After much discussion, the western conference voted not to require a coinsurance clause. The eastern underwriters, to secure proper protection for themselves, insisted upon some form of coinsurance. A fifty per cent clause was adopted, evidently as a compromise between the two alternatives of not placing the percentage too high to prevent the sale of the insurance or not requiring any coinsurance at all.[41] This percentage is in use in the East and the South today, although as explained later, the premium rate is varied to allow credits for higher percentages of insurance to values.[42]

The principle of coinsurance was gradually accepted by the companies in the Middle West, but not without a considerable

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[39] Hoffman, F. L., *op. cit.*, p. 38, states that the clause is used by all companies.

[40] *Weekly Underwriter*, July 1, 1905, p. 602.

[41] Dunham, *Business of Insurance*, Ronald Press Co., 1912, Volume II, p. 541.

[42] See Chapter V on Rates and Rate Factors.

lapse of time. In 1909, although it was generally required, many companies failed to comply with the rules, and this caused others to complain of the unfair methods of competition.[43] In 1913, the Chicago Board of Underwriters is reported to have applied the principle "to tornado insurance so as to prevent the under-insurance which has been prevalent on this class."[44] Since the formation of the Eastern Tornado Association in 1916, the coinsurance principle has been used in all sections of the country, excepting of course, those jurisdictions where it is prohibited or limited by legislation.

3. *Tornado Insurance Associations*

(a) Eastern Tornado Insurance Association

The northeastern United States was the last section to obtain regulation of the windstorm business through the formation of an underwriters' organization. This was due to the relatively smaller hazard which caused in turn a smaller volume of premiums in this area. Prior to 1916, only two or three rates were used, and no special classifications of risks were agreed upon by the companies.[45] This competitive state of affairs caused much friction between the companies and a remedy finally became necessary. In 1916, about twenty leading stock fire insurance companies organized for the purpose of securing uniformity in the field. The territory covered included the New England states, the Middle Atlantic states, the District of Columbia, and West Virginia.

The objects of the association as given in the constitution are: to disseminate useful information; to determine forms of building and construction best adapted to withstand the impact of wind; to promote adequate protection to property owners, and (when and where not in conflict with law) to regulate rates, forms, and conditions of insurance contracts.

All companies (except reinsurance companies) are eligible to

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[43] *Weekly Underwriter*, July 10, 1909, p. 16.
[44] *Ibid.*, April 26, 1913, p. 446.
[45] *Letter* from George F. Hayden, Secretary, Eastern Tornado Insurance Association.

membership. A company to become a member must sign and approve a copy of the constitution and by-laws. Withdrawal is permitted upon sixty days' notice. Any change in a rate, classification or commission must be assented to by a vote of seventy-five per cent of the membership. The executive committee has the power to fix and promulgate rates applying to risks not specifically classified.[46]

Following its organization, the association proceeded to carry out the objects expressed in its constitution. Particular attention was paid to commissions, rates, and policy forms. Maximum commissions, a schedule of rates for various classes of property, and policy forms were adopted as soon as proper organization would permit.

Changes in regulations from time to time have been made where experience directed. A standard windstorm policy (to be described later)[47] which has been adopted by the association must be used throughout its territory. Until 1928, the association made and promulgated minimum class and schedule "rate sheets."[48] All minimum rates were based upon the use of a fifty per cent coinsurance clause.[49] The rate sheet in 1927 contained rates cove ing about seventy different classifications and rules governing the writing of the business. In 1928, the association adopted a manual of rates, rules, and forms which is in use today.[50]

(b) Other Tornado Associations

The conditions prevailing at the origin of the SouthernTornado Association and the Western Union (now the Western Underwriters Association), which regulates the business in the Middle West, have been described previously.[51] In the far west,

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[46] See p. 139.
[47] See Chapter III.
[48] From a *Report on Methods and Manner of the Eastern Tornado Association*, dated June 1, 1927, made by the Insurance Department of New York State and on file in the Superintendent's office.
[49] *Ibid.* Only two classes of risks were rated by schedule; viz: movable marine legs of grain elevators, and movable coal, ore, and stone handling apparatus.
[50] See Chapter V for a description of this manual.
[51] See p. 63.

the Board of Fire Underwriters of the Pacific regulates the windstorm business, but in that territory the windstorm business is negligible. The objects and the organizations of these associations are similar to those of the Eastern Association and need not be repeated here. Rates and policy forms are covered in other chapters.[52]

4. *Volume*

Table VI shows the growth of the windstorm insurance from 1905 to 1930 from the standpoint of premiums received and losses paid each year. In 1908, premium income was greater than $1,000,000 for the first time. Following a decrease in premiums in 1909, they increased to more than $4,500,000 in 1912, and losses paid exceeded $1,000,000. Steady growth followed until 1921, when the business depression caused a substantial fall in premium income.

The large losses shown for the years 1924 to 1927, inclusive, were due to one of the most disastrous periods of windstorm losses in the history of the country.[53] 1926 and 1927 were the worst years. While many severe storms occurred during these two years, two were outstanding. The severe hurricane in Florida in September 1926, caused the companies to pay over $8,000,000 in losses.[54] On September 29, 1927, a tornado struck St. Louis, causing damage of more than $15,000,000, of which at least a third was covered by insurance.[55]

The companies fared better in 1928, although total property damage throughout the country due to windstorms was almost as great as in 1927. The better showing of the companies for 1928 can be accounted for by the larger premium income in that year and the smaller losses paid. The companies naturally became more careful following the large losses in 1927. Risks

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[52] See chapters III and V.

[53] See table No. IV.

[54] The *National Underwriter*, April 15, 1927, p. 35. The New York State Insurance Report for 1927, p. 13, gives a higher figure of $15,000,000.

[55] *The Insurance Almanac*, 1928, p. 1110 states that $10,000,000 in damage occurred. Other estimates range as high as $40,000,000. The figure given is probably the more representative. See *The St. Louis Tornado*, published by the Inspection Department, Associated Factory Mutual Insurance Companies, November 1927, p. 1.

were accepted only after careful scrutiny, and in certain areas instructions to agents caused little new business to be transacted until the companies could adjust losses and orientate themselves.[56]

TABLE VI

WINDSTORM PREMIUMS AND LOSSES IN THE UNITED STATES, 1906–1929*
(In Thousands of Dollars, i.e. 000 omitted)

YEAR	PREMIUMS	LOSSES	RATIO OF LOSSES PAID TO PREMIUMS RECEIVED
1906	864	132	15.2
1907	966	148	15.3
1908	1,109	246	22.1
1909	740	306	41.3
1910	972	133	13.6
1911	1,805	512	28.4
1912	4,667	1,870	40.7
1913	4,620	1,401	30.3
1914	6,745	2,667	39.5
1915	6,295	2,523	40.0
1916	7,427	2,200	29.5
1917	13,568	4,844	35.7
1918	12,764	5,112	40.0
1919	16,508†	4,471†	27.0
1920	21,602	7,235	33.4
1921	17,888	6,335	35.4
1922	22,457	7,376	32.8
1923	28,663	9,967	34.7
1924	32,653	15,691	48.0
1925	39,162	15,215	38.8
1926	37,096†	17,518†	47.2
1927	39,786†	26,248†	65.9
1928	42,211†	12,466†	29.5
1929	44,767†	15,254†	34.0

*Compiled from figures given in *Distribution by States of Fire Insurance* prepared and published annually by the Spectator Company until 1926. Since 1919, this company has also published a compilation of premiums and losses on windstorm insurance in their *Insurance Year Book*. Other sources of windstorm premiums and losses are the *National Underwriter* which has published a summary each year and *Fire Insurance By States* published by the Weekly Underwriter Company. *The Distribution by States of Fire Insurance* is the only source of premiums and losses for the earlier years.

† From *Insurance Year Book*, Spectator Company.

[56] One large company, following a severe hurricane in Florida, notified its agents in that territory that until further notice certain classes of risks were not to be accepted either as new business or as renewals. The result was to practically prohibit new business. In addition conservative line limits were placed upon risks which were renewed and aggregate limits for certain areas were set.

Present Status[57]

The entrance of the stock fire companies into the windstorm field in the 80's and the rapid growth of their windstorm business, overshadowed for some years the business of the mutual companies. The local and county mutuals, however, had continued to grow and to increase their volume of windstorm protection. Because of the restricted area over which the local mutual companies operated, they became subject to what amounted to catastrophe losses.[58] To avoid this risk, they cooperated in forming mutual companies which specialized in windstorm insurance over areas equal to one or more states. In 1913, the Associated Factory Mutual Insurance Companies began to sell windstorm protection[59] in connection with their fire insurance business and today the volume of this insurance protection is considerable. One reciprocal has become an important fixture in the business. It is desirable, therefore, to devote the remainder of this chapter to describing briefly the nature and importance of the windstorm business of each of these types of companies.

Stock Companies

1. *Importance—Generally*

Two hundred ninety-nine companies of all kinds wrote windstorm insurance in the United States in 1929. Of this number,

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[57] Windstorm insurance has not assumed the same importance in other large countries as in the United States. The reason in most cases is the smaller hazard. As explained in the first part of Chapter I, winds in the United States are more violent than in any other large country.

Windstorm insurance was attempted for a time in Germany. In 1898, a casualty company, the Colognian Accident Insurance Company introduced the coverage in the Rhenian-Westfalian industrial section. One other company the Stuttgarter Mit-und Ruckversicherungsgesellschaft sold windstorm insurance. Windstorm insurance has not been sold in Germany since the disappearance of the latter company following the War. See Manes, Alfred, *Versicherungs-Lexikon*, E. S. Mittler & Sohn, Berlin, 1924.

In Canada, the amount of windstorm insurance sold is relatively small Most destructive winds are of the straight blow type and rarely cause considerable damage over any limited area. In 1928, about 90 companies (15 Canadian, 20 British, and 55 foreign) wrote windstorm insurance, collecting about $190,000 in premiums. Total premiums for the preceding twenty years were somewhat under $1,800,000. (See the annual reports of the Superintendent of Insurance of the Dominion of Canada.)

[58] Valgren, V. N., *Farmers' Mutual Fire Insurance in the United States*, University of Chicago Press, 1924, p. 54.

[59] *Weekly Underwriters*, February 22, 1913, p. 214.

TABLE VII

PREMIUMS AND LOSSES—LEADING LINES, 1925–1929*

(In Thousands of Dollars, i. e. 000 omitted.)

		FIRE	MOTOR VEHICLE	OCEAN MARINE	WIND-STORM	INLAND MARINE	HAIL	SPRINKLER LEAKAGE	EARTH-QUAKE	RIOT ETC.
1925.....	Premium.....	703,169	102,719	42,947	36,848	31,424	16,610	1,903	Not	6,102
	Losses.....	387,814	48,709	28,385	13,203	16,151	10,320	920	Given	3,101
	Ratio.....	55.1	47.4	66.0	35.8	51.3	62.1	48.3		50.8
1926.....	Premium.....	735,398	121,953	41,749	37,096	35,406	14,985	3,659	2,568	2,465
	Losses.....	395,032	60,972	31,149	17,518	17,735	8,310	1,756	1,223	109
	Ratio.....	53.7	49.9	74.6	47.2	50.0	55.4	47.9	47.6	44.2
1927.....	Premium.....	719,402	128,177	41,532	39,786	39,688	16,867	2,409	2,684	2,443
	Losses.....	325,590	60,802	31,218	26,248	18,902	12,972	893	355	2,175
	Ratio.....	45.2	47.4	75.1	65.9	47.5	76.9	37.0	13.2	89.0
1928.....	Premium.....	742,463	118,489	46,419	42,211	46,962	19,223	2,353	2,249	4,348
	Losses.....	330,717	46,850	27,568	12,466	9,901	12,541	1,306	131	1,685
	Ratio.....	44.5	42.0	59.4	29.5	21.0	65.2	55.5	5.8	38.7
1929.....	Premium.....	720,822	139,074	48,255	44,767	45,844	13,712	2,635	2,227	6,495
	Losses.....	338,325	58,762	28,608	15,254	18,945	5,174	889	3	2,406
	Ratio.....	46.9	42.2	59.2	34.0	41.3	37.7	33.7	.1	37.0
Average...	Premium.....	722,230	122,082	44,180	40,161	39,865	16,679	2,591	2,357	4,370
	Losses.....	355,495	55,219	29,385	16,938	16,127	9,863	1,152	428	1,895
	Ratio.....	49.0	45.8	66.8	42.5	42.2	59.4	44.5	16.6	51.9

*Compiled from *Insurance Year Book*, Spectator Co., 1930.

two hundred forty-three were American direct writing companies; twelve were American reinsurance companies; thirty-three were foreign direct writing companies; and eleven were foreign reinsurance companies.[60] Total premiums collected by these companies amounted to $44,767,128 for the year.

Table VII shows the importance of the windstorm business compared with the other leading lines sold by stock companies. For the five-year period, 1925–1929 inclusive, windstorm insurance ranked fourth from the standpoint of volume of business; the fire, motor vehicle, and ocean marine lines exceeded it, and the latter by a small margin only. During 1928 and 1929 inland marine premiums have exceeded those of windstorm insurance by a small margin. For the five-year period, windstorm business exceeds inland marine premiums by just a small amount. In such a comparison, however, it should be remembered that the figures are for stock companies only, and, as will be pointed out shortly, a considerable amount of windstorm insurance business is done by mutual companies.

2. *Importance—Leading Companies*

A small number of stock companies are outstanding in the windstorm business. Table VIII shows ten companies which collected over $1,000,000 each in windstorm premiums during 1929. Two companies collected well over $2,000,000 each. These ten companies did more than thirty-six per cent of the business.

3. *Underwriting Practices*

As is usual in insurance, stock companies selling windstorm insurance have formed underwriters' associations for the purpose of regulating underwriting practices. Four sectional associations now regulate the business throughout the country.

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[60] *Insurance Year Book*, Spectator Company, 1930. The National Underwriter, April 18, 1930 reports a somewhat larger number, making no distinction as to the kinds of company.

(a) Underwriting Associations

Eastern Tornado Association with headquarters in New York City. This association exercises jurisdiction over the following states: Maine, New Hampshire, Vermont, Rhode Island, Massachusetts, Connecticut, New York, Pennsylvania, Maryland, New Jersey, Delaware, District of Columbia, and West Virginia.

Southern Tornado Association with headquarters in New York City. This association exercises jurisdiction in Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Louisiana, Texas, and Mississippi.

TABLE VIII

STOCK COMPANIES COLLECTING OVER $1,000,000 IN WINDSTORM PREMIUMS DURING 1929*

NAME OF COMPANY	NET PREMIUMS	LOSSES PAID
Hartford	2,902,866	1,259,408
Home, N. Y.	2,705,326	1,119,537
Aetna	1,857,946	807,472
Continental	1,550,728	689,423
National Fire, Conn.	1,521,926	508,157
Fidelity-Phenix	1,419,075	659,518
American, N. J.	1,371,432	454,886
Globe and Rutgers	1,050,499	515,071
Springfield F. and M.	1,040,385	353,568
St. Paul F. and M.	1,009,978	383,388
Total	16,430,161	6,750,428

*Compiled from *Insurance Year Book*, Spectator Company, N. Y., 1930.

Western Underwriters Association with headquarters in Chicago, Illinois.[61] Jurisdiction is exercised in eighteen states:[62] Illinois, Indiana, Iowa, Ohio, Michigan, Wisconsin, North Dakota, South Dakota, Minnesota, Nebraska, Kansas, Missouri, Oklahoma, Kentucky, Tennessee, Wyoming, Colorado, and New Mexico.

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[61] Another association, the Western Insurance Bureau exists for much the same objects as the Western Underwriters Association. The two associations differ in the regulations concerning commissions to agents. The territory is the same except that the Western Insurance Bureau has jurisdiction in Arkansas and West Virginia, and no jurisdiction in New Mexico. *Letter* from S. S. Stewart, Assistant Secretary.

[62] *Letter* from C. R. Street, President.

Board of Fire Underwriters of the Pacific with headquarters at 914 Merchants Exchange Building, San Francisco, California. Jurisdiction is exercised in the state of California, Arizona, Nevada, Montana, Utah, Washington, Oregon, and Idaho.[63]

Practically all stock companies which sell windstorm insurance belong to one or more of the above named underwriters associations.

The first two associations exist for the sole purpose of regulating windstorm insurance. The other two are organizations which have assumed jurisdiction over the windstorm business in addition to their regulation of other lines of insurance. All the associations, however, exist for the purpose of maintaining uniformity in underwriting practices. Such uniformity is obtained chiefly through the regulation of rates, policy forms, endorsements and rules for the conduct of the business.

(b) Government Supervision

In most states the activities of underwriters associations are limited to a great extent by statutes relating to various phases of insurance. In a few states these limitations actually amount to prohibitions. A description of these limitations and prohibitions with respect to rates and policy forms is necessary in order to show the present status of the business.

(1) Rates

The laws of the various states as they apply to windstorm rates may be divided into three classes: *direct laws* or those which specifically mention the windstorm (or tornado) business so there can be no doubt of their application; *indirect laws*, or those which, while not specifically mentioning the business, can be interpreted in such manner as to be effective; and finally laws which are not so worded as to permit any form of windstorm regulation.[64]

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[63] *Letter* from Thomas H. Anderson, President.

[64] The incorporation laws are not referred to here. Most states have incorporation laws applying to insurance companies only (as distinguished from industrial concerns, banks, etc.). In this type of incorporation law the authority to write windstorm insurance is found in what is known as the fire clause. A typical fire clause is that found in the Massachusetts Statutes (*Massachusetts Laws*, Chapter 175, Section 47) which reads as follows: "To insure against loss or damage to property by fire, lightning, and other electrical disturbances, *wind, tornado, tempest, cyclone*, earthquake, hail, frost, snow, ice, weather or climatic conditions . . ."

Only a few states have the direct type of law, and in most cases the power over rates is limited. Louisiana in 1926 passed a law "to establish uniform rates for fire, windstorm and hail . . . and to prohibit discrimination in insurance rates; to provide for the organization of a 'Rating and Fire Prevention Bureau'; to create an Insurance Commission . . . "[65] Windstorm rates, as a result of this law, must be formulated by the Louisiana Rating and Fire Prevention Bureau which is an organization of insurance companies made compulsory by statute. These rates are then submitted to the Louisiana Insurance Commission for approval. Approval may be withheld if the rates are excessive or discriminatory. In South Dakota, the law states that, "no fire, fire and marine, or marine and inland insurance company or association shall directly or indirectly, enter into any contract . . . for the purpose of making, establishing or maintaining a general flat advance or reduction of state-wide basic rates . . . affecting the cost of fire, lightning and tornado insurance . . . except such agreements as may be filed with and approved by the Commissioner of Insurance."[66] Any order of the Commissioner may be reviewed by a circuit court upon the petition of any interested party. In Oklahoma, "every fire, tornado and plate glass insurance company . . . shall file with the said board a general basis schedule showing rates . . . "[67] The State Insurance Board may order a change in rates if they are excessive, inadequate, or discriminatory. Wisconsin laws require that "every stock company insuring against fire, lightning, windstorm or sprinkler leakage must belong to a rating bureau."[68] The Commissioner has power to prevent unreasonable or discriminatory rates. Kansas has a law similar to those just mentioned. Windstorm rates must be filed with the Commissioner and he may order them lowered or raised if he determines that such rates are too high or not adequate.[69] In Tennessee, where rates are advisory only, the

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[65] *Act* 302 of 1926 (Senate Bill Number 220).
[66] *Laws* of 1919, Chapter 231, Section 5.
[67] *Compiled Statutes* of 1921, Chapter 21, Section 8, Article II.
[68] *Insurance Laws of Wisconsin*, Chapter 201, Section 203. 36.
[69] *Laws of 1927*, Chapter 231, Section 40,923.

law prohibits discrimination of "fire, lightning and windstorm" rates.[70]

Most state laws come within the class of what is here called indirect laws. In this class no reference is made anywhere in the statutes (except regarding powers to transact the business) to windstorm or tornado insurance as transacted by stock fire companies. However, through the use of their general power of administration and by interpretation, which in many cases is very liberal, the Insurance Commissioners of such states have proceeded to regulate the windstorm rates under existing laws.[71] Oregon furnishes a typical example of the indirect law, where a proper basis exists for regulation of windstorm rates. Every insurance company, whether domestic, foreign, or alien, except a marine insurance company, before it will be permitted to transact business in the state, must file in the office of the Insurance Commissioner its rating schedules to be used in the transaction of business in the state. Discrimination is unlawful and deviation from such filed schedules is not permitted unless new schedules are filed. A schedule of a rating bureau may be filed in lieu of the company's own schedules, if such a rating bureau is organized according to the law.[72] Rating bureaus may be organized by any person or persons, companies, etc., but "the business of conducting a rating bureau in this state is public service in character and shall be conducted without profit to any party . . . Every rating bureau shall . . . file in the office of the Insurance

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[70] *Acts of 1919*, Chapter 24.

[71] In some states the courts have given the Insurance Commissioner powers which are administrative or quasi-judicial rather than ministerial. In American Casualty Insurance Co. vs. Tyler, 60 Conn. 448, the company was refused admission to the state because it had an unusual charter. The Commissioner had extensive powers and duties in the supervision of the insurance business in the state but no statute applied to the matter in question. The court ruled that the Commissioner's duties were to determine whether the applicant had complied in all respects with the statutes prescribed by the state and this involved not a ministerial function but rather the exercise of official judgment and sound discretion as conferred by the law. The court went so far as to say that even if it thought the Commissioner's construction of the law was an incorrect one, it could not interfere by way of mandamus as had been requested. But the Insurance Commissioner may not exercise what amounts to legislative powers. See O'Neill vs. Insurance Co., 166 Pa. 72, and Nalley vs. Home Insurance Co., 250 Mo. 452.

[72] *Oregon Insurance Laws*, Section 6328, Subdivision 7, p. 8.

Commissioner its rating schedules and shall not deviate therefrom until amended or corrected rating schedules shall have been filed in the office of the Insurance Commissioner . . . "[73]

The regulation of windstorm business in New York is fully provided for by law, although not with specific reference thereto. The requirements are similar to those for Oregon. Every person, association, or corporation authorized to transact the business of insurance within the state must comply with the rates and rules issued by the rating organization in which it has a membership. Such rating organization must furnish its service without discrimination to any person, association or company authorized to transact the business within the state. The rating organization is subject to the supervision of the Insurance Commissioner and its rates must not be unreasonable nor discriminatory.[74]

Other states with indirect laws are: Indiana, Ohio, Pennsylvania, Michigan, West Virginia, South Carolina, Mississippi, Missouri, Arkansas, and Washington. In all of these states some control is exercised.[75] In many of them, however, it appears that such control rests upon the Commissioner's initiative and a liberal interpretation of the law. In Ohio, for example, the law requires every insurer "against loss or damage by fire or lightning" to file with the Commissioner a schedule of its rates, or to become a member of a recognized rating bureau. The law applies to fire companies (most of which do a windstorm business) but is not clear as to what rates are to be filed. The Commissioner, having this limited control over the fire companies and their rating bureaus, exercises control over any rate which may, at a hearing, be shown to be discriminatory.[76] Pennsylvania, Indiana, West Virginia, South Carolina, Missouri, Washington, Michigan, Mississippi, and Arkansas have laws similar to Ohio. In some of these states, however, the laws contain certain features which seem to warrant control over windstorm rates.

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[73] *Ibid.*, Section 6389, Subdivision 8, p. 45.
[74] *See New York Insurance Law Annotated*, 1927 Edition, Sections 141 and 141 b.
[75] Result of questionnaire to all State Insurance Departments.
[76] *Letter* from C. S. Younger, Superintendent of Insurance.

In Michigan, the Commissioner can determine the adequacy or excessiveness of any rate charged by a fire insurance company on any Michigan risk.[77] In Mississippi, the Commissioner can order a reduction in rates charged by a fire company if the underwriting profit exceeds five per cent on the business done in the state for the past five years.[78] A similar law exists in Arkansas.

The states not mentioned thus far do not attempt any regulation over windstorm insurance rates.[79] In some states this is because of a lack of proper statutes authorizing such regulation.[80] In others, it appears that liberal interpretation of existing laws would furnish a sufficient basis for limited regulation. It is interesting to note that some of the most important windstorm states fall in this class. Illinois, Minnesota, Nebraska, Texas, North Dakota, Georgia, and Iowa attempt no regulation of rates.[81]

(2) Form of Policies

(i) Legal Requirements

While many states have seen fit to set forth in their laws the fire insurance contract which companies must use, there is as yet no state with a law specifying the terms of a standard windstorm insurance contract.[82] Some standardization is achieved, however, where the state has a general set of requirements to apply to all insurance contracts. These usually take the form of printing specifications, the inclusion of certain words to show the type of company selling the insurance, size of the policy, etc.

Standardization of the windstorm policy, other than in the

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[77] Chapter IV, Act 256, *Public Acts 1917*, as amended by Act 12, 1923.

[78] *Laws of Mississippi for 1924*, Chapter 188.

[79] Questionnaire to Insurance Commissioners.

[80] In Kentucky, an attempt was made several years ago by the State Auditor to prevent an increase in windstorm rates. The matter was taken to the Eastern Federal District Court of Kentucky where the court, in a verbal opinion, stated that the Kentucky Statutes did not make proper provision for the supervision of such rates. (From a letter to the writer by A. H. Pulliam, Deputy Commissioner of Insurance.)

[81] Questionnaire to Insurance Commissioners.

[82] The contract is, however, fairly well standardized throughout the country. See Chapter III for its content and analysis.

way just stated, is not being obtained through the efforts of the various State Insurance departments. Probably less than a third of the states require the companies to submit their windstorm insurance contracts for approval before they are used within the state. In response to a question addressed to the various state insurance authorities, the following states indicated that approval of some sort must be had: Oklahoma, Kansas, West Virginia, Indiana, Pennsylvania, Iowa, Nebraska, South Dakota, Louisiana, Arizona, and Connecticut.[83] Many of the states with a large windstorm insurance business do not attempt such regulation. The reason for this lack of regulation appears to be the absence of statute provisions which the insurance departments must have as a basis for such action. This is particularly true in Illinois and Texas, and possibly other states with large windstorm losses each year.

In some respects the status of the combined fire and windstorm policy is different from that of the separate windstorm policy.[84] Most state insurance departments permit such a combined policy to be issued without any restrictions. In a few states restrictions are imposed. Arkansas requires the rates and premiums for each coverage to be set forth separately; Kansas requires the amounts of insurance to be the same in both coverages; in Iowa certain provisions must be met when companies associate for the purpose of issuing joint policies. Michigan in 1929 provided by statute that combined policies could be sold by the attachment of an approved rider to the standard fire policy.[85] In Oklahoma, a combined policy is permitted on dwellings, merchant risks, and special hazards. New Jersey in 1929 permitted, by statute, the use of a supplemental contract

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[83] Forty-four replies were received out of forty-eight sent. The number enumerated may be too small due to a lack of agreement as to what the word *standard* as used in the question meant. The question asked was: Is a standard windstorm insurance policy in use in your state? (a) If so, is such a standard required by law? (b) By department ruling? By agreement among companies in the absence of (a) and (b)? The nature of the replies and subsequent correspondence, however, lead the writer to feel that the above list of states is substantially correct.

[84] A combined policy is one which includes protection against two or more hazards. It is not usual to include protection against hazards other than fire, lightning, and hail in the windstorm policy.

[85] *Act 154*, Chapter II, Section 7, 1929.

form by which windstorm insurance together with insurance against loss due to falling aircraft, hail and/or riot may be written in conjunction with the fire policy.[86] The trend thus seems to be toward permission for the use of such a policy. A few states, however, definitely prohibit the issuance of a combined policy. In Minnesota, Missouri, Louisiana, Texas, and Vermont, it is prohibited by departmental ruling. In Oregon the laws specifically prohibit its use,[87] and in a few states its status is doubtful because no rulings have been made on the question.

(ii) Underwriting Practices—Policy Forms

It was pointed out that when stock companies first began to write windstorm insurance the coverage was included in the fire policy by means of a rider attached thereto.[88] One of the disadvantages of this method of selling the coverage was that during the severe period of competition which followed, the windstorm protection was sold at cut rates or given to the insured free as an inducement to get him to buy fire insurance. This explains partly the existence today of an all but universal underwriting rule that "tornado risks must not be covered by an endorsement or rider attached to a fire policy." This rule exists, also, because the underwriting problems of the two classes of business require different policy conditions.

In all sections except the East, risks may be covered by separate and distinct windstorm policies or by means of a combined fire and windstorm policy issued according to certain rules. Usually, the amounts covering against fire and windstorm must be the same and the rate must not be less than the full combined fire and windstorm rates for the particular risk. In the Middle West combined policies are common. There are two usual forms, one covering dwellings against damage due to fire and windstorm; the other a general combined policy covering all other risks against the same hazards. In the combined

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[86] *Laws of 1929*, Chapter 283. This contract is now sold in many states of the East and in Ohio and Indiana in the West. Its use is being extended where statutes permit.

[87] *Oregon Insurance Laws*, Section 6342, (1) p. 17.

[88] See pp. 57, 60.

dwelling policy, personal effects are covered and provision is made for the insuring of rents and rental values. The policy conditions are partly a combination of the windstorm and fire policies, eliminating of course, any duplications that might occur. New clauses are added where necessary and arrangement of the form is made to fit the purpose in mind.[89]

The issuance of a combined windstorm and fire policy in the East is rare. It is permitted on certain risks because of competition but otherwise the rules forbid it.[90] In New Jersey, as a result of a recent amendment to the insurance statutes, there is now being sold a "supplemental contract" which can be attached to the fire policy providing for "loss or damage caused by falling aircraft, explosion, hail, riot and/or windstorm."

What has been said thus far does not apply to farm risks for which special underwriting rules have been devised. For this class of risks special contracts are used which in some cases are much different from the standard windstorm insurance contract. In the usual farm policy provision is made for protection against fire, lightning, windstorm, and hail damage.[91]

Mutual Companies

Windstorm insurance is sold throughout the United States by many mutual companies. In number they exceed by far the stock companies which do the greater portion of the business. They are of all kinds. In their nature and characteristics they differ not only from the stock companies but among themselves. Some entered the windstorm field before the stock fire companies and sold the coverages in connection with their fire protection. Others entered the field only during recent years. Of these, some sell the coverage in connection with fire and other protection; others specialize in windstorm insurance only. There follows a brief discussion of the windstorm business done by the farmers' mutuals, the factory mutuals, and reciprocal types of insurance companies.

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[89] See the appendix for copies of these policies.

[90] See the manual of rates and rules of the Eastern Tornado Association, p. 21. Also the *Weekly Underwriter*, June 21, 1930, p. 1592.

[91] See p. 143.

1. *Farmers' Mutual Companies*

(a) Nature and Characteristics

As early as 1820 farmers organized local mutual companies for the purpose of insuring their own property. By 1850 more than one hundred of these companies were in existence.[92] It was this type of company which first sold windstorm insurance in the United States by offering its members protection against *storm* damage in 1858.[93] The number of farmers' mutual companies continued to grow until 1900. Since 1900 the number has not increased greatly. Growth has taken place through enlargement of existing companies.[94] At the close of 1926, 1910 of these companies were in operation.[95]

Most farmers' mutual companies are organized under general state statutes which exist for this purpose. Membership ranges from 25 to over 30,000, the average being about 1500.[96] The territory over which these companies operate is limited. The majority operate over only a part of the state in which they are incorporated and many of these confine themselves to counties and townships.[97]

(b) Amount of Windstorm Protection

No figures are available to show the total amount of windstorm insurance sold by farmers' mutual companies. Almost all the companies furnish protection against the hazards of fire and lightning. About thirteen per cent of all the companies furnish protection against windstorm losses in addition to fire and lightning protection. Companies furnishing this combined protection are located in all parts of the country except the Pacific Coast and the New England States. With the larger companies

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[92] Valgren, V. N., *Farmers' Mutual Insurance Companies in the United States*, The University of Chicago Press, 1924, p. 11.
[93] See p. 54.
[94] Valgren, V. N., *op. cit.*, p. 20.
[95] Valgren, V. N., *A Decade in Farm Mutual Development*, Journal of American Insurance, February 1929, p. 27.
[96] Valgren, V. N., *Farmers' Mutual Fire Insurance Companies in* the United States, *op. cit.*, p. 34.
[97] *Ibid.*, p. 39.

operating over all, or the greater part of a state, protection against the three hazards is the usual practice. In the case of smaller companies, such a coverage is fairly common in the South, but rather unusual in the Middle West.[98] Total insurance in force at the close of 1926 for all risks sold by farmers' mutual companies was close to $10,000,000,000.[99] Assuming that ten per cent of this was combined insurance including windstorm protection[100] and taking an average rate of one dollar per thousand of insurance for the cost of the windstorm element, which is conservative, the premium income of this class of companies amounts to about $1,000,000 per year for windstorm protection.

(c) Mutual Windstorm Insurance Companies

In many of the states local mutual companies which grant windstorm protection in addition to fire and lightning, have had severe losses. Risks were covered which from the standpoint of the fire hazard, were considered safe from conflagration losses. Single storms, however, often brought losses over part or all of the territory over which a company operated. The companies found by experience that the law of average in connection with the windstorm hazard did not work as it did in the field of the fire hazard. The law would work only when larger territories were covered, the risks more numerous, and over a much longer period of time. As a result of their adverse experience, many of the local fire companies no longer grant the windstorm protection. In the Middle West, mutual companies have been formed for the sole purpose of selling windstorm insurance over one or more states. In the states of Iowa, Indiana, Ohio, Missouri, and North Dakota, close cooperation exists between the local mutuals and state windstorm companies. Windstorm protection formerly sold by local companies is now handled by

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[98] In 1916, Valgren reports this figure as 15 per cent. During the following ten years there was a decrease to 13 per cent and even this figure is now believed to be too large. *Ibid.*, p. 37.

[99] Valgren, V. N., *A Decade of Farm Mutual Development*, p. 27.

[100] It was stated above that 13 per cent of all companies furnish windstorm protection in addition to fire and lightning. This assumption is warranted, therefore, if these companies do 10 per cent or more of the total volume of business.

larger mutual windstorm companies. The annual State Convention of the local mutuals is usually attended by the reprsentatives of the state windstorm mutuals and officials of the windstorm mutuals are generally associated with local mutual companies.[101] In the states of Illinois, Michigan, Wisconsin, Minnesota, and South Dakota there exist district mutual windstorm companies which operate in cooperation with local mutual fire companies.[102] The following companies are the largest of the mutuals doing this type of windstorm insurance business.[103]

MUTUAL WINDSTORM INSURANCE COMPANIES*
(Premiums and Risks in Thousands of Dollars)

COMPANY	NET PREM.	RISKS IN FORCE
Iowa Mutual Tornado Insurance Association, Des Moines, Iowa	517	569,385
Michigan Mutual Windstorm Insurance Co., Hastings, Michigan	605	452,389
The State Mutual Cyclone Insurance Co., Lapeer, Michigan	597	318,028
Farmers Home Mutual Tornado and Cyclone Insurance Company, Madelia, Minnesota	462	164,399
Indiana Mutual Cyclone Insurance Company, Indianapolis, Indiana	198	121,556
Ohio Mutual Tornado, Cyclone and Windstorm Association, Bucyrus, Ohio	216	131,958

*Compiled from *Insurance Year Book*, Spectator Co., 1930.

2. *Factory Mutual Insurance.*

(a) Nature and Characteristics

Factory Mutual Fire Insurance Companies were formed more than ninety years ago when manufacturers in the New England States combined for the purpose of reducing losses and providing insurance at cost. Today twenty-eight such companies are

[101] Representatives of these companies also take a prominent part in the annual convention of the National Association of Mutual Insurance Companies. The proceedings and papers of the annual convention are published each year by the association.

[102] Valgren, *V. N., Farmers' Mutual Fire Insurance Companies in the United States, op. cit.*, p. 57.

[103] The policy forms of this type of company are discussed in Chapter III. Copies of the policies will be found in the appendix.

located throughout the United States, furnishing insurance to certain manufacturing risks which meet their standards. Their insurance is sold in all states except Arizona, Idaho, Nevada, New Mexico, South Dakota, and Wyoming. These states are largely agricultural, having few or no large manufacturing industries. The companies cooperate in their prevention activities, loss settlements, and to a large extent, in the division of insurance sold.

(b) Hazards Covered

Following their original purpose, factory mutual companies grant protection against losses of various kinds. Losses due to fire, lightning, windstorm, sprinkler leakage, and explosions are covered.[104] Windstorm losses are covered up to fifty per cent of the fire coverage. Windstorm protection includes hail damage and incidental damage due to rain. The amount of windstorm coverage was increased by the Factory Mutual Companies from twenty-five to fifty per cent on January 1, 1930, without an increase in gross rate charged. In exceptional cases the windstorm coverage is not granted. If the insured wishes to pay extra, he may obtain additional windstorm protection up to the amount of his fire protection.[105] Use and occupancy insurance is provided under separate contracts.

(c) Importance of the Windstorm Coverage

Over 7500 separate risks are covered by factory mutual policies.[106] With a total insurance in force on November 30, 1930, of $10,107,000,000,[107] the average amount of insurance in force per risk was about one and one-third million dollars. On most risks, the windstorm protection is between twenty-five and fifty per cent. The following summary of losses of all kinds shows the importance of windstorm claims compared with all other claims:

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[104] Lightning protection includes damage to electrical equipment. Explosion does not include explosion of pressure containers.

[105] For the provisions of the windstorm part of the policy see Chapter III.

[106] A risk is one or more buildings at one location. The same owner may have a number of risks in the same city but located at different places.

[107] *Factory Mutual Record*, January 1931, p. 7.

SUMMARY OF LOSSES FOR 1929[108]

	LOSSES BUT NO CLAIMS	CLAIMS	TOTAL LOSSES	AVERAGE PER CLAIM
Fires	221	1,746	$1,826,577	$1,346
Sprinkler Leakage	63	321	161,048	502
Windstorm	26	385	242,423	632
Use and Occupancy	...	88	80,332	913
All Losses	310	2,540	$2,311,380	$910

Reciprocal Insurance

Reciprocal insurance is mutual in principle. It provides for insurance to members of a group, each protecting the other according to an agreed basis, the arrangement being carried out through the appointment of a manager called an attorney-in-fact. Such a plan, generally called an inter-insurance exchange when applied to a specific case, may be used to furnish protection against losses due to one hazard only, or it may include two or more hazards of different kinds.[109] The Tornado Inter-Insurance Exchange of Duluth, Minnesota, is an outstanding inter-insurer, organized for the sole purpose of providing windstorm protection to its members.[110] This exchange was organized in October 1920 with eight original members. The primary purpose of the organization was to "provide an engineering service and enlist the cooperation of the members in preventing windstorm loss to movable bridges and towers of a type" used by the members in coal and iron ore dock operations.[111] Because the stock companies could not provide sufficient protection, "this exchange provided for distribution of nominal amounts of insurance through each member underwriting a

[108] *Factory Mutual Record*, March, 1930, p. 5.

[109] See *Bests Insurance Reports*, Fire and Marine, 1930, p. 1065. for a different classification.

[110] The power of attorney which each member signs states a maximum amount for which the signing member is liable upon any one property of any one of the other members. Each member thus underwrites individually, and at the same time, purchases insurance upon his own property from each of the other underwriting members.

[111] *Letter* from E. M. Heinselmann, Manager. See also *Bests Insurance Reports*, Fire and Marine, 1930, p. 1145.

portion of every other member's risk."[112] Since its organization, the number of members has increased to sixteen and the separate units of property at risk number about seventy-five. The value of these risks approximates two and one-half millions of dollars. In order to protect its members against the high liability per unit of risk, the exchange carries $1,000,000 excess insurance over a first loss which may be sustained in any one storm of twenty-four hours duration.[113] $750,000 of this excess coverage is carried with London Lloyds and is automatically reinstated in case of loss.[114]

Reciprocal exchanges which include protection against windstorm losses in addition to protection against other hazards are fairly numerous, particularly in the case of automobile reciprocals operating in the Middle West. Due to their methods of reporting, it is impossible to ascertain with any exactness, the volume of premiums or insurance in force on windstorm risks. The total amount of such business, however, is relatively small.[115]

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[112] *Ibid.*
[113] *Ibid.*
[114] *Bests, op. cit.*, p. 1146.
[115] For a list of these exchanges and their records see *Bests, op. cit.*, pp. 1067 to 1157.

III

Policy Forms and Their Analysis

It was stated in the preceding chapter that windstorm insurance is sold by different types of companies and that while the business originated sometime before 1858, it did not become an important "side line" until the beginning of the present century. It was pointed out also, that since the origin of the business, the policies used by the companies have undergone numerous changes, many of which were due to court rulings on the various provisions. While there have been fewer than one hundred important cases dealing with windstorm policies, sufficient rulings have been made to give a clear idea of the meaning of the provisions of the contracts in use today. It is the purpose of this chapter to point out these provisions and to make clear their respective meanings. This will be done by taking up first the contracts used by the stock companies and following with an analysis of the contracts used by the important types of mutual companies. For the convenience of the reader, a summary of the important provisions of each type of contract is presented at the end of this chapter.

Stock Company Contracts

The stock fire insurance companies do by far the greater portion of the windstorm business and for this reason their contracts are of special interest. As pointed out in the preceding chapter, the companies have formed four underwriters associations, each governing the windstorm business within its territory. Hereafter, these sections of the country will be referred to as the East, the South, the Middle West, and the Pacific Coast.[1]

Since no state has seen fit to pass a statute requiring a standard windstorm contract,[2] theoretically, a company can use any policy form it pleases provided it is not in conflict with any

[1] See p. 73.
[2] See p. 78.

law of the state where it is used. Practically, however, a standard contract has been developed and this varies only slightly in different parts of the country. The use of a standard contract is not surprising when it is considered that a large stock company generally operates over all or a greater part of the United States and, therefore, is a member of one or more of the underwriters associations which regulate the windstorm insurance business. The contract in use today is a product of the evolution in the windstorm insurance business. It is the contract which the companies consider the best.

The standard contract is used in insuring most windstorm risks.[3] As in the case of fire and other lines of insurance where a standard contract is used, numerous forms have been devised which are attached in order to fit the policy to each particular risk. Some of the most important of these forms will be discussed following the analysis of the standard policy.

1. *Standard Windstorm Policy*

The standard windstorm policy adopted by the Eastern Tornado Association in August of 1928 will be used as a model in this analysis. This contract is the last to be approved by any windstorm organization and it represents the latest ideas about the subject. Important differences between this contract and those used in the other jurisdictions will be noted as the various points are discussed.[4]

(a) The Insuring Clause

"In consideration of the stipulations named herein and of..... Dollars Premium does insure.....and legal representatives, to the extent of the actual cash value (ascertained with proper deductions for depreciation) of the property at the time of loss or damage, but not exceeding the amount which it would cost to repair or replace the same with material of like kind and quality within a reasonable time after such loss or damage,

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[3] Where combined policies are issued, the provisions pertaining to the windstorm hazard are the same as those contained in the standard windstorm policy. Therefore, the analysis given here applies. (This is not true for combined policies used for farm risks. See p. 81)

[4] Copies of these contracts will be found in the appendix.

without allowance for any increased cost of repair or reconstruction by reason of any ordinance or law regulating construction or repair and unless otherwise specifically provided for hereinafter, without compensation for loss resulting from interruption of business or manufacture, for the term of..... from the.....day of.....19...., at noon, to the..... day of.....19...., at noon, against all direct loss and damage by windstorm, cyclone and tornado except as herein provided, to an amount not exceeding..... Dollars, to the following described subject of insurance while located and contained as described herein, but not elsewhere, to wit:

This clause with one exception is similar to that used in the standard fire policy and its scope and meaning are so well known that it need not be considered here.[5] The exception is the clause "against all direct loss and damage by windstorm, cyclone and tornado." The words in this clause are the same as those used in the first windstorm policies sold by stock companies.[6] Sufficient time has, therefore, elapsed to permit an explanation of their importance and meaning when used in the manner stated.

(1) Meaning of "Windstorm, Cyclone and Tornado"

When the policy was first formed (and even at the present time) the terms cyclone and tornado were used by most persons interchangeably. Technically, their meanings are entirely different.[7] While the courts have not agreed upon exact definitions for these words, their meanings can be ascertained with a fair degree of definiteness by consulting important cases. In the case of Queen Insurance Company vs. Hudnot Company,[8] the court said, "the words tornado and hurricane are synonymous, and mean a violent storm, distinguished by the vehemence of the wind and its sudden changes; while the definition of a cyclone is 'a rotary storm or whirlwind of extended circuit.' It is evident, therefore, that a hurricane is a very high wind."

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[5] See Huebner, S. S., *Property Insurance*, D. Appleton & Co., 1924. It should be noted here that in one state, at least, windstorm insurance is not subject to a valued policy law. In Nalley vs. Home Insurance Co., 250 Mo. 452, it was ruled that the statute did not apply to windstorm insurance because it referred to "fire and lightning" and made no reference to other kinds of insurance.

[6] See p. 57.

[7] See Chapter I.

[8] Queen Insurance Co., vs. Hudnot Co., 8 Ind. (App.) 22 (1894).

In another case, Spensley vs. Lancashire Insurance Company,[9] the court ruled that, "a tornado is a violent gust of wind, or a tempest, distinguished by a whirling progressive motion, usually accompanied by severe thunder, lightning and torrents of rain, and commonly of short duration and small breadth; a hurricane." Finally, in another noted case[10] the court said that a "windstorm" as used in a policy insuring against loss or damage by windstorm, cyclone and tornado, takes its meaning from the words "tornado and cyclone" with which it is associated and should be construed to be something more than an ordinary gust of wind, no matter how prolonged; and though the whirling features which usually accompany tornadoes and cyclones need not be present, it must assume the aspect of a storm. These definitions show that the courts do not resort to technical definitions but use the words in their popular sense and meaning and in the light of the purpose for which the contract was made.[11] Under such interpretations, therefore, the use of the words windstorm, cyclone and tornado as grouped together in the insuring clause does not bear criticism. The companies have intended that the policy should cover any damage or loss caused by all violent winds and, in general, the courts have interpreted the words in this way.[12]

The words "windstorm, cyclone and tornado" just described are used in stock company policies throughout the country with the exception of some policies in use on the Pacific Coast which which specify "tornado, windstorm, or cyclone." The reason for the use of the word *or* instead of *and* is not clear. If there is any choice the best way of stating the hazards would seem to be "tornado, cyclone *and/or* windstorm," although in view of court decisions any one of the three methods seems adequate.

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[9] Spensley vs. Lancashire Insurance Company, 54 Wisc., 441.

[10] Jordan vs. Iowa Mutual Tornado Insurance Co., 151 Iowa 73 (1911).

[11] "The rights of the parties to contracts of the special kinds of insurance recently developed are to be determined in accordance with the terms of each contract, construed in the light of the purpose for which it was made and according to the general rules of insurance law." Vance, *Insurance*, Second Edition, West Publishing Co., 1930, p. 910.

[12] In view of the above statement, the reader may ask the reasons for the emphasis on the nature of the hazard in the first chapter. For these reasons see p. 11. As stated there, this emphasis is necessary for a proper understanding of the hazards excepted in the policy (to be discussed later in this chapter). Criticisms and suggested changes in the policy forms cannot be given without it.

(2) Meaning of the word "Direct"

A matter which must be considered at this point is the meaning of the word "direct" as used in the insuring clause. This involves the doctrine of proximate cause. Stated in general terms, the company must pay all losses caused by windstorm, even though the windstorm was not the immediate cause, provided the damage was the natural result of the windstorm and could have been expected under the circumstances.[13] Such a general rule, however, is difficult to apply. When damage occurs due to a windstorm accompanied by one or more other hazards such as rain, lightning, floods, and tidal waves or overflows,[14] it is often difficult, if not impossible to determine the true cause of the loss. The case of Phenix Insurance Company vs. Charleston Bridge Company[15] illustrates the problems involved in a typical loss adjustment. Suit was brought under a policy insuring against direct loss or damage to a bridge by windstorm, cyclone or tornado, but excluding liability for damage caused by high water, floods, or freshets. Evidence tended to show that the bridge was damaged by schooners and barges being driven against it by a wind which also caused an abnormal rise in the water. However, the evidence was insufficient to permit the jury to determine what proportion of the loss, if any, was due to the high water. The court held that the jury was correctly instructed that if the efficient cause of the damage was high water, the policy did not cover the loss, but if the dominant efficient cause was a windstorm, then recovery might be had. The case fell within the rule that when the damage from each cause cannot be distinguished, then the party responsible for the damage caused by the predominating efficient cause is liable for the whole loss. The jury decided that wind was the cause.

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[13] See Huebner, S. S., *Property Insurance*, D. Appleton and Company, 1924, p. 109 for a discussion of proximate cause in fire and marine insurance.

[14] See p. 51.

[15] Phenix Insurance Company vs. Charleston Bridge Company, 25 United States (app.) 190. (1895).

Cases of this kind[16] served as an incentive for the companies to insert numerous exceptions in the policy.[17] At the present time, approximately one-fourth of the policy is devoted to exceptions. While not contained in the policy in the following order, they may be logically divided into: hazards not covered; hazards conditionally covered; hazards not covered except by special agreement; property not insurable; property not covered except by agreement; and property conditionally covered. A discussion of each group follows.

It should be noted in passing that the word "direct" is used in the above manner in windstorm policies in all parts of the country.

(b) Hazards Not Covered

"This company shall not be liable for loss or damage, whether incidental to a windstorm, cyclone and /or tornado or not, caused by frost or cold weather; nor for loss or damage caused directly or indirectly by cloudburst, explosion or lightning; nor for loss or damage caused directly or indirectly by tidal wave, high water or overflow, whether driven by wind or not; nor by civil commotion, nor by military or usurped power; nor by order of any civil authority; nor by theft whether occurring during or after a windstorm, cyclone and /or tornado; nor by neglect of the insured to use all reasonable means to save and preserve the property during and after a windstorm, cyclone and /or tornado.

A number of these hazards are common to the fire contract and need not be considered here. The others will be considered in two groups:

(1). Frost or Cold Weather; Cloudburst or Lightning

The "frost or cold weather" exclusions will be considered first.

In the Middle West and the South two hazards, the snowstorm and blizzard, are included in the policy in connection

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[16] Other cases of this nature: Jordan vs. Iowa Mutual Tornado Insurance Company, 151 Iowa 73 (1911); Queen Insurance Company vs. Hudnot Company, 8 Ind. (app.) 22 (1894); Kenney vs. Farmers' Mutual Fire Insurance Society, 159 Iowa 490 (1895); Tyson vs. Union Insurance Society, 8 Fed. (2nd) 356, (1924).

[17] See p. 63 for the exceptions in the first standard contract adopted in 1905.

with the frost or cold weather exclusions. On the Pacific Coast snowstorms are included but not blizzards. Destructive winds which cause damage to insured property frequently accompany snowstorms and blizzards. The intention of the companies in inserting these words was to exclude damage which might be due to temperature alone or to the weight of snow causing buildings to collapse and melting snow which seeps through to the interior. It was not their intention to exclude damage due to the wind or resulting directly therefrom. To omit these words would increase the protection to a general storm damage cover which is not the purpose of the contract.[18] In preparing the new policy in 1928, the Eastern Tornado Association omitted the word blizzard and took care of snow damage in a manner which will be pointed out shortly.[19]

In view of several important court rulings, the effectiveness of these exclusions may well be questioned. Where one or more of the excepted hazards accompany a windstorm and a loss results, there is a tendency for the insured to make a claim for the full amount of the damage. When such a claim is made, the cause of the loss must then be determined. If it be shown that a windstorm actually occurred, the company to be absolved from liability must not only prove that the loss comes within the exceptions mentioned in the policy but also show that the excepted hazard was the efficient and predominating cause and not an irresponsible cause which was incidental thereto. The case of Jordan vs. Iowa Mutual Tornado Insurance Company is important with respect to these principles.[20] The policy insured

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[18] Protection against loss caused by lightning is not necessary because this hazard is generally included in the fire insurance contract.

[19] See p. 98.

[20] Jordan vs. Iowa Mutual Tornado Insurance Company, *op. cit.* Another similar case is Trexler vs. Allemania Fire Insurance Company, 136 Atlantic Reporter, 856 (Pa. 1927). The policy insured lumber sheds against direct loss and damage by cyclones, tornadoes and windstorms and definitely excluded loss by snowstorms. Wind, rain, and a heavy snow occurred and the pivotal question of the trial was whether snow pressure or wind caused the collapse of the sheds. The court ruled in effect that when concurring causes of the damage appear, the proximate cause of the loss is the dominant, the efficient cause that sets all others in motion and incidental causes, though nearer in time and place to the loss, are not proximate. The trial judge properly charged the jury that to recover, the plaintiff must prove that the windstorm was the dominant and

cattle against loss or damage due to tornadoes, cyclones or windstorms and contained two exceptions, loss or damage due to snow or hail. A severe blizzard (wind, snow and cold) occurred and lasted for three days causing the death of the cattle. A jury trial was waived and the case was tried on the issues presented. The court ruled: the testimony of the storm justified the trial court in calling it a windstorm within the meaning of the policy; the company's contention that the policy covered only losses due directly to windstorms such as throwing the cattle to the ground or against some object was much too narrow; the company's contention the loss was due to temperature changes and not wind, while a question of fact, was not proven and the trial court was justified in assuming the loss would not have occurred but for the windstorm which was the efficient cause of the damage; the burden was on the company to show that the loss was due to snow or hail and this it failed to do.

While no court decisions are available regarding frost and cloudburst losses, it seems probable that should such questions come to the court, the same lines of reasoning would be followed as were noted in the cases just cited. That this part of the policy is not satisfactory is shown by the recent changes made therein and by the previous comparison of the Eastern form with policy forms of other jurisdictions.

(2) Tidal Wave, High Water, or Overflow

All risks located near bodies of water are subject to damage caused by tidal wave, high water, or overflow when a windstorm occurs. In many cases the loss which occurs to risks so located has the characteristic of a flood damage, the insurance of which has not been successfully carried out in this country. The companies desire not to assume such liability because in most cases the damage due to high water or overflow is inevitable on risks in such locations. These exceptions, therefore, have the

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efficient cause of the loss, and that recovery could be had although a peril outside the policy may have remotely or incidentally contributed thereto. In this manner the court disposed of the snow damage exception and the case of Iowa vs. Mutual Tornado Insurance Co. was cited as a precedent. See also Phenix Insurance Co. vs. Charleston Bridge Co., *op. cit.* for a similar decision.

same general purpose and status as those just discussed. They are treated separately because of their importance and as a matter of convenience in handling court decisions of a different line of reasoning.

In contrast with the decisions regarding the excepted hazards of frost, cold weather, snowstorm, and blizzard, the courts have in the main carried out the intentions of the companies to exclude from the policy liability for loss or damage due to tidal wave, high water and overflow. In the first mentioned group of excepted hazards, the court cases dealing with the subject fell within the rule that the party responsible for the damage caused by the predominating efficient cause is liable for the whole loss.[21] In connection with the second group of hazards the courts have not considered the question of proximate cause. The case of Coyle, et al vs. Palatine Insurance Company, Limited[22] contains most of the problems which are likely to arise in connection with this list of exceptions and illustrates clearly the line of reasoning followed by the courts in arriving at their decisions. The case grew out of the Galveston storm of 1915 and was submitted without a jury on the following agreed statements of facts. The total damage was $4,512. Of this amount, $3,352 in damage was the result of the combined action of wind and water and it was impossible to determine to what extent each element was a factor with the other in causing the loss. The policy contained the insuring clause and the exceptions regarding tidal wave, high water and overflow as mentioned above. The company sought to determine its liability with respect to the second item of $3,352. Rendering a decision in favor of the insured, the trial court at the end of a lengthy opinion said, "but even if it should be held that the exceptions were applicable as limitations upon the general loss clause of the policy, yet the court finds there has been no tidal wave, high water, overflow or cloudburst within the meaning of such conceptions . . . It un-

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[21] This rule applies whether or not the damage from the different causes can be distinguished. Compare the cases: Phenix Insurance Company vs. Charleston Bridge Company and Trexler vs. Allemania Fire Insurance Company.

[22] Coyle et al vs. Palatine Insurance Company, Limited, 222 S. W. 973 (Commission of Appeals, Texas, 1920).

doubtedly appears from the evidence that it was the violent and tempestuous action of the wind that set in motion and gave the water its power for harm . . . The efficient predominating cause of such waves and damage occasioned thereby was the direct force of the wind alone. . . ."

The insurer appealed to the Court of Civil Appeals on the grounds that the damages claimed were not covered by the policy but resulted in part from the causes excepted in the policy. The higher court was of the opinion "the policy by its terms was essentially a wind damage policy. It seems plain," said the court, "that the exceptions were inserted to make sure the company's promise of indemnity did not extend to certain loss or damage which might be held attributable to the wind, and which, therefore, but for the exceptions, might be held to be covered by such promise." The exceptions would be useless if they were inserted to protect the company from liability for damage by water occurring independently of wind because the policy does not purport to cover anything but wind damage. The court disposed of the insured's argument about wind being the proximate cause by saying that a hurricane could occur without water damage as an incident thereto, and in the face of what seems to be a plain agreement to exclude such a loss from the policy, the court could not but hold the parties to their contract.

The insured appealed the case to the Commission of Appeals on the ground that the Court of Civil Appeals erred in placing the burden of proof upon the insured to show that the damage in question was chargeable directly to the force of the wind and in holding that under the facts the wind was not the direct and predominate cause of the damage.[23] The judgment of the Court of Civil Appeals was upheld on the first point and the second question was not considered because the parties had agreed at the outset that it was impossible to distinguish between the damage done by the wind and the water.

In other cases the decisions have upheld the tidal wave, high water or overflow exceptions in the contract. Thus where a

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[23] Compare this with the case of Jordan vs. Iowa Mutual Tornado Insurance Company, p. 94.

frame dwelling near the sea was destroyed by a high wind after the tide had washed out the foundation supports the court held that even though the water was driven by the wind, the loss fell within the provision of the policy excepting losses caused by water.[24]

All water damage losses do not occur near the sea. A river overflowed and surrounded the insured building. The water was from two to four feet deep in the building when a high wind arose and caused such heavy waves that the building was thrown over.[25] It was held that the company was not liable. The damage was not directly caused by the windstorm because if the water had not been present the waves would not have blown against the building. The court refused to entertain the proximate cause argument because the loss suffered was not contemplated in the contract. The location of the risk along the Ohio River made it apparent that the parties had in mind a situation such as the one that arose when they made the contract.[26]

The tidal wave, high water or overflow exceptions discussed under this heading are included in policies sold in all parts of the country.

(c) Hazards Conditionally Covered

(1) "This Company shall not be liable for loss or damage caused by rain and/or snow, whether driven by wind or not, unless any building herein shall first sustain an actual opening in roof and/or walls by the direct force of a windstorm, cyclone and/or tornado, and shall then be liable only for such loss or damage to the subject of insurance as may be caused immediately by rain and/or snow entering the building through openings in roof or wall as the direct result of such windstorm, cyclone and/or tornado; nor for loss or damage caused by water from sprinkler equipment or other piping unless such equipment and/or piping be damaged as a direct result of a windstorm, cyclone and/or tornado."

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[24] Newark Trust Company vs. Agricultural Insurance Company, 150 C. C. A., 542 (1916).

[25] National Fire Insurance Company vs. Crutchfield, 170 S. W. 187 (Kentucky C. A., 1914).

[26] Compare this with the decision in the case of Phenix Insurance Company vs. Charleston Bridge Company, *op. cit.* (see p. 92).

Under this clause the companies decline to assume liability for damage from rain or snow unless such damage is the direct result of actual wind damage to the property insured. Past experience has shown that it is a common practice for numerous claims to be made under windstorm policies after a very hard rain or snow storm.[27] While the companies are willing to pay legitimate claims, they wish to exclude damage caused by rain being blown in windows left open, wind beating the rain through and under the roofs, and snow damage of a similar character.

In general, it may be said that the courts have upheld the exclusion of such losses from the policy, although under the reasoning presented in the case of Jordan vs. Iowa Mutual Tornado Insurance Company and others, exceptions seem to have little value to the company unless the excepted hazard becomes the principal cause of the loss.[28] Because the companies cover these hazards conditionally, the losses which they cause become chiefly problems for the adjuster.

The exception pertaining to damage caused by water from sprinkler equipment and other piping, unless such equipment be damaged by wind, is inserted in the windstorm policy because the sprinkler leakage policy does not cover loss or damage caused directly or indirectly by cyclone, tornado or windstorm.

The policy used in the Middle West and South specifies that the company shall not be liable for water or rain damage under the conditions stated above. Snowstorm damage is not included

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[27] See *The Weekly Underwriter*, November 20, 1915, for a statement that the walls of 40,000 buildings were damaged by rain and wind which swept the city of St. Louis. Numerous claims were presented to the companies under windstorm policies. For court cases see: Coyle et al vs. Palatine Insurance Co. Ltd., 222 S. W. 973 (Commission of Appeals, Texas, 1920); Cotton Brothers Co. vs. Home Insurance Co., 147 La. 308 (1920).

[28] This case and the others cited on p. 93 would seem to take away much of the value of any exceptions in the policy. However, the other cases cited in connection with the excepted hazards of high water and overflow fully uphold the companies in denying such liability. The few cases that have arisen in connection with rain damage give full effect to the exception, being decided upon lines of reasoning similar to the high water and overflow cases. For example, in the case of Cotton Brothers Cypress Co. vs. Home Insurance Co., 147 La. 308 (1920) the court said that where a windstorm policy is made "subject to stipulations, including a disclaimer of liability for loss or damage by water or rain, save under certain specified conditions, there can be no recovery for loss by water or rain unless those conditions are found to exist."

as in the Eastern policy because such damage is listed as an exception in connection with lightning, frost, cold weather, etc.[29] Water damage resulting from injury to the sprinkler system is covered as it is in the Eastern policy. On the Pacific Coast, the policies cover water and rain damage as in the Middle West, but no mention is made of liability for damage resulting from injury to sprinkler systems. Probably losses of this kind could be recovered under the policy but the absence of this provision makes the coverage somewhat more restricted than that sold in the other parts of the country.

(2) "This company shall not be liable for loss or damage by fire, whether caused by windstorm, cyclone and/or tornado or not, except that in case any building herein described, or any material part of such building, fall as a direct and immediate result of a windstorm, cyclone and/or tornado, this policy shall extend to cover only such direct loss or damage by fire to the subject of insurance, according to the conditions of this policy, as may result from fire immediately following as a direct result of such windstorm, cyclone and/or tornado; provided, however, that in no case shall this policy extend to cover any loss or damage by fire unless all insurance against loss or damage by fire, if there be any such insurance, has ceased because of the falling of said building, or any material part thereof, as a result of such windstorm, cyclone and/or tornado."

The above is known as the "bridging the gap" clause. It was adopted by the Eastern Tornado Association in 1926[30] as a result of a peculiar situation which existed due to the wording of the windstorm policy. Prior to this time the windstorm policy stated that "in case of fire occurring subsequent to any loss or damage by windstorm, cyclone or tornado, this company shall be liable under this policy only for such loss or damage as occurred previous to said loss or damage by fire and for no loss by fire whatever." The New York Standard Fire Insurance policy contains the following provision: "If a building, or any material part thereof, fall except as the result of fire, all insurance by this policy on such building or its contents shall immediately cease."

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[29] See p. 93.
[30] See *Journal of Commerce*, March 5, 1926.

Should the insured carry both fire and windstorm insurance, under a strict interpretation of each of the policies, if there were a partial damage by wind followed by destruction of the rest of the property by fire, a recovery for the fire damage could not be had. Nor would the insured be better off with but one of the two policies. The exemption provision in each policy was perfectly clear and a change in the wording of one was necessary to give the insured protection. After discussing the matter for some time, the clause in the windstorm policy was changed to the one quoted above.[31] No criticism of the present clause can be found. It should be noted, however, that recovery under this clause is limited by the coinsurance, contribution, and other provisions in the policy.

The "bridging the gap" clause is now in the policies used in the Middle West and South, having been adopted in these territories at about the same time it was brought into use in the East.[32]

Windstorm policies issued on the Pacific Coast do not give protection against fire damage following a windstorm but still contain the clause stating that in case of fire occurring subsequent to any windstorm damage the company shall be liable only for such loss as occurred prior to the fire loss. The reason for the continued use of this restricted coverage is not clear.[33]

(d) Hazards Not Covered Except by Special Agreement

"Unless otherwise provided by agreement in writing added hereto, this company shall not be liable for loss or damage caused by hail, whether driven by wind or not, nor, except as otherwise provided hereinbefore, for any other consequential loss."

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[31] Few cases actually arose where the insured, if he took out fire and windstorm policies, did not recover in full. Companies generally adopted the attitude that where the policies were taken out in the same company and for the same amounts, recovery could be had for fire loss under the windstorm policy if it did not come within the terms of the fire policy.

[32] See the *Insurance Press*, April 15, 1925.

[33] One reason has been offered, as follows: The only safeguard which fire underwriters on the Pacific Coast have against earthquake losses is the fallen building clause in the fire policy. The insertion of a "bridging the gap" clause in the tornado policy without additional charge would establish a precedent which in some manner might break down the integrity of the fallen building clause in the fire contract.

This clause definitely excludes hail damage except when such liability is assumed or "except as otherwise provided hereinbefore." This latter phrase means except when an opening is caused by the wind and hail enters through the opening causing damage to the interior.

The earliest policies issued by stock companies contained hail damage exceptions and in general the courts have given full effect thereto.[34] As early as 1899 a higher court ruled that a windstorm policy does not cover damage by hail, though accompanied by damage caused by wind, when there is a provision in the policy excluding liability for damage "from hail or lightning, directly or indirectly."[35] A few years later in another case[36] the court rendered a similar decision in spite of the argument of the insured that wind was the proximate cause of the hail, and that the same principles applied in this case as in Queen Insurance Company vs. Hudnot Company, previously cited.[37]

Rulings of this kind on the part of the courts, while carrying out the intentions of the framers of the contracts, have not eliminated all trouble for the companies in connection with the hail damage exception. In many losses where hail accompanies a windstorm, it is extremely difficult to refute the insured's contention that the loss was not caused by hail entering openings first made by the wind.[38] Not to pay these losses may incur ill will on the part of the insured and the agent or broker toward the company. To avoid this trouble many agents refuse to write windstorm insurance unless the insured is willing to pay extra for hail coverage and have his policy endorsed to cover this hazard. Other agents call the attention of the insured to the provisions of the policy by using red stickers on prominent parts

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[34] See p. 61.
[35] Holmes vs. Phenix Insurance Company, 98 *Fed. Rep.* 240 (1899).
[36] Hartford Fire Insurance Company vs. Nelson, 64 *Kansas* 115 (1902).
[37] See p. 93.
[38] See National Union Fire Insurance Company vs. Harrower, 280 S. W. Rep. 656 (Ark. 1926).

of the policy. One insurance commissioner ruled that all policies sold in the state must cover hail damage.[39]

The exemption in the policy against hail damage is standard throughout the country.

(e) Property Not Insurable

"This policy shall not cover accounts, bills, bullion, currency, deeds, evidences of debt, money, notes, securities or manuscripts; nor grain, hay, straw or other crops outside of buildings; nor radio aerials and their supports . . . "

To explain the refusal to insure the articles in this list, they may be logically divided into two groups. In the case of accounts, bills, bullion, currency, and valuable papers, the moral hazard is considered too great to permit the assumption of liability for wind damage. Concealment on the part of the insured is easy. Furthermore, it is often difficult to determine the value of such articles.[40] The second group of articles (mentioned in the latter half of the clause) are so susceptible to windstorm damage that the companies decline the insurance under any conditions. Even those companies which specialize in the insurance of farm risks (under different kinds of contracts from the standard considered here) will not insure grain, hay, straw, and other crops against windstorm losses when located outside of buildings. These companies, however, will insure such property against fire and

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[39] In 1924, Commissioner McMahan of South Carolina issued a ruling which stated in part: "I disapprove and disallow for use in this state insurance policies heretofore in use against damage by tornado, cyclone or any form of windstorm. All windstorm insurance policies written in this state since the recent tornado should be cancelled unless they have attached to them the rider including insurance against damage by hail. As soon as possible, policies should be substituted of a form approved by me."

[40] A list of articles similar to this first group is found in the standard fire policy. It is interesting to note that two items, bullion and manuscripts, which may be covered by specific endorsement under the fire policy, are here listed with property not insurable. The reason for this is not clear. These two kinds of property do not seem more hazardous than many others which may be covered under the windstorm policy by special endorsement.

See Huebner, S. S., *Property Insurance*, D. Appleton & Company, 1924, p. 116.

lightning if it is in stacks or shocks and located on cultivated ground of the insured.[41]

The policy used throughout the Middle West and South, is not so restrictive, containing only part of excluded articles mentioned in the Eastern form. The policy states the company "shall not be liable for loss or damage to accounts, bills, money, deeds, evidences of debt, securities, bullion, manuscripts. . . ." The Pacific Coast contract is somewhat more restrictive than the Eastern form. Excluded property includes accounts, bills, money, deeds, evidences of debt, securities, bullion, manuscripts, awnings, signs, and temporary or board roof additions. The last three classes of property can be covered by specific agreement under Middle Western and Eastern forms.

(f) Property Not Covered Except by Agreement

"nor, unless specifically named hereon in writing, automobiles, tractors and other self-propelled vehicles, awnings, books of account, casts, cranes or hoisting apparatus unless in enclosed buildings, curiosities, drawings, drilling rigs, electric or telephone or telegraph transmission wires and their supports outside of buildings, fences, jewelry, live stock, lumber, medals, medal stacks, models, oil derricks and/or pumping rigs, patterns, pictures, radio towers, scientific apparatus, sculpture, signs, silos or their contents, sheds unless entirely enclosed or their contents, temporary roofs, temporary roof structures or their contents, temporary or board-roof additions or their contents; nor buildings or contents of buildings in process of construction or reconstruction unless entirely enclosed and under permanent roof with all outside doors and windows permanently in place; nor articles, materials or other personal property and/or open structures not otherwise specifically excluded hereunder outside of enclosed buildings."

This rather extended clause contains a list of kinds of property which the companies prefer not to insure. While the chance of concealment and fraud are not as great as in the case of the excluded property and values can be determined with some degree of exactness, the loss experience on properties in this list is such

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[41] This kind of insurance is not and should not be confused with crop insurance which is an entirely different form of protection. See copies of farm policies in appendix.

that the companies find it difficult to make the business pay.[42] When they do assume the risks, they wish to make special provisions which are not adaptable to a standard policy.

In the Middle West and South the policy contract contains a much smaller list of property items and in this respect the policy is not as restrictive as the Eastern form. Furthermore, because the Middle Western form is older,[43] the arrangement is different. For example, it lists accounts, bills, money, deeds, evidences of debt, securities, bullion, and manuscripts under the heading of "Uninsurable and Excepted Property," and then continues, "nor (unless otherwise provided by agreement in writing endorsed hereon), to casts, curiosities, drawings, medals, models, jewelry, patterns, pictures, scientific apparatus or sculpture." Later in the policy under a heading "Hazards not covered except by Special Agreement," the policy states that liability for hail damage is not covered unless provided in writing on the policy, "nor for loss or damage to metal smoke stacks, awnings, signs, temporary or board roof additions, nor for loss or damage to buildings (or their contents) in process of construction or reconstruction unless same are entirely enclosed and under roof, with all outside doors and windows permanently in place."

The Pacific Coast policy is less restrictive than any of the other forms discussed. It enumerates metal smoke stacks, casts, curiosities, drawings, medals, models, jewelry, patterns, pictures, scientific apparatus, sculpture, and store or office fixtures.

(g) Property Conditionally Covered

"This policy shall not cover any plate, stained, leaded or cathedral glass when such glass is covered against loss by breakage under any other kind of insurance policy or contract. When such glass is not otherwise covered, this policy shall extend to cover such glass; it being expressly stipulated that when such glass is covered hereunder, only such proportion of the insurance under this policy on any building covered hereunder covers on plate, stained, leaded or cathedral glass therein as the value of such glass bears to the value

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[42] Hubbard, Clarence T., *Where Fire Insurance Leaves Off*, Crofts & Company, N. Y., 1930, p. 19.

[43] The Middle Western form was adopted about fifteen years ago. The Eastern form was approved in 1928.

of said building, and the amount of insurance on such glass, so ascertained, shall apply to each plate of glass covered hereunder in the proportion that the value of each plate of glass bears to the total value of all such glass."

Several things are to be noted with respect to this clause. Only plate, stained, leaded, and cathedral glass are mentioned. Ordinary window glass is covered in the same manner as any other property. The company refuses to accept liability if there is other insurance of any kind covering the glass, regardless of the amount of such insurance. If, however, no other insurance has been taken out on the glass, liability is assumed under the conditions named. The amount the insured can recover in case of a loss is limited by the amount of insurance applying to the glass. This amount of insurance is determined by comparing the value of the glass with the value of the building and taking that fraction of the total amount of the windstorm insurance. This is the principle involved in the pro rata distribution clause and, therefore, for the insured to be covered in full for any glass loss, he should take out insurance equal to the value of the building. If, for example, the building were valued at $10,000 and the glass at $1,000, and the insured took out $5,000 windstorm insurance, one-tenth of the insurance or $500 would apply to the kinds of glass named. No loss to plate glass (valued at $1,000) greater than $500 could be recovered. Furthermore, because windstorm insurance is invariably written with a 50 per cent (or greater) coinsurance clause, the insured, unless he takes out the required amount of insurance to values, will recover losses only in the proportion that his insurance bears to the required amount. In this case, all plate glass losses under $500 will be paid in full because he has taken out the required amount ($5,000) of insurance. If, however, the insured had taken a $3,000 windstorm policy he would collect three-fifths of any loss that might occur.

The last member of the clause is merely a further apportionment of the amount of insurance that applies to all plate glass. If this condition were omitted, the amount of insurance applying to the glass would be a blanket coverage on each plate and the total amount would apply to one or more plates, regardless of the value of each.

The purpose of such a clause as the foregoing is obviously to have the insured take out insurance equal to value if he wants complete glass coverage. Glass is more susceptible to wind damage than the rest of the building. If the clause were not included, the insured could take out the required amount of insurance (usually 50 per cent of value) and then, because his insurance would always be sufficient to cover the value of the glass, collect in full on all glass damage.

The plate glass clause in the policy used in the Middle West is similar to the above except that insurance applies regardless of other insurance on the glass, "and plate glass, accident or casualty insurance shall be deemed other insurance and treated as contributing insurance." The Pacific Coast policy is similar to the Middle Western form, except that no mention is made of apportioning the insurance applicable to glass over each plate as its value bears to the total value of all such glass.

(h) Other Standard Provisions

Other provisions of the standard windstorm policy include those about ownership, fraud, misrepresentation, cancellation, pro rata liability, mortgagee interest, requirements in case of loss, appraisal, company's options, when the loss is payable, suit or action under the policy and subrogation. It will not be necessary to discuss these because similar provisions are to be found in the standard fire policy.

2. *Standard Forms and Clauses*

As in most other lines of property insurance, provisions are made in the windstorm rules for the use of certain forms and clauses to change or supplement the standard policy. These forms and clauses are necessary to fit the standard contract to the specific conditions of each particular risk. Forms are prescribed for each of the various business interruption lines, for builders' risks, and for mortgage interests of certain institutions.[44] One of these forms, that covering the mortgage interest,

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[44] For an explanation of business interruption insurance see Kahler, C. M., *Business Interruption Insurance*, Rough Notes Co., Chicago 1930. For the most important clause, that dealing with coinsurance, see Chapter V. *infra*.

should be noted here because of the increased importance that it has assumed during the last few years.[45]

Many banks, building and loan associations, and other lending institutions, in addition to requiring the mortgagor to take out windstorm insurance to protect the loan, are willing to buy a blanket windstorm policy for additional protection. Specific windstorm policies may not be required by the mortgagee due to competition. There may be cases when, through mistake, not enough insurance is carried. Whatever the situation, a blanket policy covers errors and omissions of all sorts. The usual form covers the mortgagee interest in full for any windstorm loss on mortgages placed on dwellings and mercantile properties provided enough insurance is carried to meet coinsurance requirements.

In the South, insurance equal to 50 per cent of all outstanding loans must be carried. Elsewhere, the percentage is twenty-five. In order to collect, the insured must establish a loss by proving that the mortgagee interest in the particular piece of property is impaired. That is, when the value of the land at the time of the loss and the remaining value of the property plus any specific insurance thereon does not equal the insured's mortgage interest, the insurance company becomes liable for the difference. Through subrogation the insurance company has the right of paying the whole mortgage interest and taking an assignment of the mortgage with whatever security exists for collateral.

Mutual Company Contracts

As has been pointed out, windstorm insurance is sold by the Associated Factory Mutual Fire Insurance Companies, the Farmers' Mutual Insurance Companies, and Mutual Windstorm Insurance Companies operating in certain states of the Middle West.[46] The contracts of the last two types of companies are similar and both need not be considered here. There follows a discussion of the Factory Mutual and State Mutual Windstorm contracts.

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[45] See p. 178.
[46] See p. 70.

1. *Factory Mutual Windstorm Contract*

The Factory Mutual Insurance Companies do not have a standard windstorm insurance contract. Windstorm coverage equal to 50 per cent of the fire insurance is now granted to most risks by the attachment of a wind damage clause to the standard fire policy.[47] Where the insured desires additional windstorm protection an extra premium will be charged.

The wind damage clause "covers the direct loss or damage which may be caused by the direct action of the wind and/or hail whether accompanied by wind or not, under the same conditions and to the same property insured against fire by this policy . . ." As the standard fire policy is used by the Factory Mutual Companies, all the conditions of that contract apply. Hail damage is covered regardless of wind action. This protection is, therefore, the same as that granted by the stock companies when they attach a hail damage clause to the windstorm policy.

There are certain exclusions named in the wind damage clause. New buildings, additions, and buildings being reconstructed and their contents, are not covered until fully closed in by walls, roofs, doors, and windows. Other property not covered includes "signs, awnings, and all property in yard outside of buildings not a fixed structure or any part thereof." Certain weather hazards are excluded. Damage caused by rain, snow, sand, or dust is not covered "unless the same shall enter the building where concurrently broken open by the direct force of the wind or by substance driven by the wind or by hail. . . ." Although not worded the same, this conditional coverage corresponds to the snow and rain damage assumed by stock companies in their standard windstorm policy. Another exception is listed, the company not being liable for "loss or damage caused when a snow-load and/or ice-load are contributing factors to the fall or collapse of a building. . . ." This exclusion is not contained

[47] This percentage was changed during 1929 from 25 to 50 per cent. In addition to the fire and windstorm protection, the policy also covers sprinkler leakage damage; explosion damage of certain kinds; and lightning damage. The coverage in each case equal is to the fire insurance. Use and occupancy protection is provided, but written under separate policies.

in the stock company form. While it may in some cases take away from the insured much needed protection, the exception prevents the payment of many unjust claims which are frequently made when a loss occurs under such conditions. Experience has shown the difficulty of separating the damage due to two or more weather hazards.[48] A final exception is "loss or damage by floods of whatever nature." This is similar to the "high water, tidal wave and overflow" exceptions in the stock company standard windstorm policy which has been fully upheld by the courts.

The windstorm coverage offered by Factory Mutual Companies is no doubt less restrictive than that offered by stock companies in general. It must be remembered, however, that Factory Mutual Companies sell to a specialized class of risks which have to meet certain high standards relating to the prevention of loss.[49] Stock companies the insurance to all classes of persons and cover all types of property. Their contract must of necessity include more restrictive provisions to meet so many different situations.

2. *State Mutual Windstorm Contracts*

These companies usually operate in rural communities and insure such risks as buildings and contents, live stock, and farm implements. Naturally, the policy content reflects the type of the risk insured and the mutual nature of the insurance arrangement. While the contracts differ somewhat between companies and especially between states due to laws pertaining to this type of business, they all have the same general characteristics. The policy begins[50] by stating that the insured has become a member of the company according to its charter and by-laws and "has insured in said company against loss or damage by tornado, cyclone or windstorm, to the amount of $. . . . on property specified below:" Following the itemized property

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[48] See p. 116.

[49] For more on this point see Chapter IV.

[50] The provisions of a typical policy are followed here. All vary somewhat as to wording, specific exclusions, etc. See the appendix for a copy of this type of policy.

with amounts of insurance on each item, is an agreement by the company to make good any loss or damage which shall be caused by windstorm by paying cash, or repairing, rebuilding, or restoring the property lost or damaged.

On the back of the policy appears in full the charter of the company and its by-laws. In the by-laws will be found a prohibited list of risks. Hay or grain in stacks, awnings on buildings, metal smoke stacks, dilapidated buildings, single corncribs, unenclosed buildings, and buildings not on a solid foundation are not covered. Included in this list also (although found in another part of the policy) are cupolas on barns or outbuildings, weather vanes, lightning rods, defective chimneys, roller doors not securely fastened at the bottom and signs or sign boards.

Damage by hail to windows and good shingle roofs will be paid. Wood-stave silos and windmills will be covered if included in a policy with other property at least ten times as valuable.

Limits of liability are stated for various kinds of live stock, windmills, and wood-stave silos. Liability is not assumed for damage due to a falling building, smoke stack, or tree, unless such damage is the immediate or direct result of a windstorm. Before a claim can be made the loss or damage must amount to ten dollars.

The policy contains a "bridging the cyclone-fire gap" clause similar to that used by stock companies in their windstorm policies.[51] It covers any loss or damage by fire which results from destruction of the building by a windstorm. The provisions regarding notice of loss, adjustment and appraisal, assignment, etc., are similar to those contained in a standard fire policy.

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[51] See p. 100.

STOCK COMPANY CONTRACTS	INSURING CLAUSE	HAZARDS NOT COVERED	HAZARDS CONDITIONALLY COVERED
1. Eastern Form (Standard Windstorm Policy adopted by Eastern Tornado Association, 1928.)	Against all direct loss and damage by windstorm, cyclone and tornado.	Frost or cold weather; cloudburst, explosion, or lightning; tidal wave, high water or overflow.	Rain and/or snow if building first sustains an actual opening by the direct force of the wind. Sprinkler leakage. Fire Loss which occurs after a material part of a building falls as a direct result of windstorm.
2. Middle Western and Southern Forms. (Standard Windstorm Policy.)	Same as Eastern form.	Same as Eastern form except snowstorm and blizzard are added.	Same as Eastern form except "water or rain" inserted instead of "rain and/or snow."
3. Pacific Coast Form. (A standard windstorm policy has not been adopted for this region. These provisions are typical.)	Against direct loss or damage by tornado, windstorm or cyclone.	Same as Eastern form except snowstorms are included.	Covers water or rain damage as in Middle Western and Southern forms. No mention is made of sprinkler leakage damage. Fire loss definitely excluded.
4. Mutual Windstorm Company Contracts. (Companies of this type have not adopted a standard contract. The provisions given are typical.)	Against loss or damage by tornado, cyclone or windstorm.	Damage due to a falling building, smoke stack, or tree not covered unless it is the direct and immediate result of windstorm.	Hail damage to good shingle roofs and windows may be included. Fire loss covered if it results from damage to building by windstorm.
5. Associated Factory Mutual Companies Contract. (Provisions quoted here are found in a "wind damage clause" which is attached to the standard fire policy.)	Covers direct loss or damage which may be caused by the direct action of the wind and/or hail, whether accompanied by a wind or not.	Loss not covered if snow-load and/or ice-load contribute to fall or collapse of building. Damage caused by floods of whatever nature.	Damage by rain, snow, sand, or dust if same enter an opening made currently by the wind or substance driven by the wind or by hail.

*For a complete list of property in this class see page 104.

(Summary Continued)

HAZARDS NOT COVERED EXCEPT BY AGREEMENT	PROPERTY NOT INSURABLE	PROPERTY CONDITIONALLY COVERED	PROPERTY NOT COVERED EXCEPT BY AGREEMENT
Hail, whether iven by wind or ot.	Accounts, bills, bullion, currency, deeds, evidences of debt, money, notes, securities or manuscripts; nor grain, hay, straw or other crops outside of buildings; nor radio aerials and their supports.	Plate, stained, leaded or cathedral glass if not otherwise insured. The insurance applies on all glass in the proportion that the value of the glass bears to the value of the insured building. It is further apportioned over each plate.	Automobiles, tractors and other self-propelled vehicles, awnings, books of account, casts, cranes, or hoisting apparatus unless enclosed in buildings, curiosities, drawings, drilling rigs, electric or telephone or telegraph transmission wires and their supports outside of buildings, etc.*
Same as in Eastn Form.	Accounts, bills, money, deeds, evidences of debt, securities, bullion, manuc ripts.	Same as Eastern form except that the insurance applies regardless of other insurance on the glass and plate glass insurance is regarded as other insurance and shall contribute its share of the damage to the glass.	Casts, curiosities, drawings, medals, models, jewelry, patterns, pictures, scientific apparatus, sculpture, metal smoke stacks, awnings, signs, temporary or board roof additions, buildings and contents in process of construction and not entirely enclosed and under roof.
Same as in Eastn Form.	Accounts, bills, money, deeds, evidences of debt, securities, bullion, manuscripts, awnings, signs, and temporary or board roof additions.	Same as Middle Western and Southern forms, except that no effort is made to apportion the insurance over each plate.	Metal smoke stacks, casts, curiosities, drawings, medals, models, jewelry, patterns, pictures, scientific apparatus, sculpture, and store or office fixtures.
None.	Hay or grain in stacks, awnings on buildings, metal smoke stacks, delapidated buildings, single corn cribs, unenclosed buildings and buildings not on a solid foundation, cupolas on barns, weather vanes, lightning rods, defective chimneys, roller doors, signs and sign boards.	Limits of liability are fixed for various kinds of live stock, windmills, and wood-stave silos.	Wood-stave silos and wind-mills usually covered if included with property at least 10 times as valuable.
None.	New buildings, additions, and buildings being reconstructed and their contents when not fully closed in by walls, roofs, doors and windows. Signs, awnings, and all property in yard outside of buildings not a fixed structure or a part thereof.	Protection under the policy is limited to not more than 50 per cent of values, unless the insured is willing to pay an extra premium.	None.

IV

Prevention of Windstorm Loss

Owners of property throughout the greater part of the continental United States are subject to loss through the injury or destruction of such property by violent winds.[1] The elimination of some of this loss may be achieved by the adoption of measures calculated to reduce the possibility of a loss. All measures of this kind may be considered as coming under the term *prevention*. What these measures consist of and their effectiveness will be considered in connection with each of the various organizations that are endeavoring to reduce windstorm losses. Before taking up specific preventive measures which have been adopted, however, it will be beneficial to consider the field from a more general standpoint. Some conclusions are drawn at the end of the chapter.

Value of Windstorm Loss Prevention

Progress in the prevention of windstorm loss has been retarded for some years by the existence of certain ideas concerning the value of such efforts. While the origin of these ideas is mainly historical in character, many prevail at the present time, especially in the field of insurance and among property owners who need windstorm protection. The following quotation from an insurance publication embodies several ideas regarding preventive efforts:

"In the case of fire insurance, property can be inspected and the fire hazard reduced by the installation of automatic sprinklers, extinguishers, alarm systems, etc. No such precautions avail in the case of tornadoes or windstorms, as has been evidenced time and again by the heaps of ruins extending over large expanses of country following these destructive acts of nature. When it comes to preventing windstorm losses, man is practically helpless. All forms of construction—frame, brick, concrete, steel, stone—are alike subject to

[1] See Chapter I.

damage or destruction if they chance to be in the path of high winds. No property owner can, therefore, be beyond the reach of the storm hazard which incidentally is a hazard which leaves less hope of salvage than do the destructive elements of fire and water."[2]

This quotation is typical of many that can be found concerning windstorm prevention. While each statement is somewhat different from the others, efforts to prevent windstorm losses are, in general, considered to be of little or no value.

The existence of such ideas is due to a number of reasons. One, concerning the nature of the hazard, is the most important. A windstorm is an act of God over which man has no control either at its inception or after it has started. Furthermore, windstorms are often extremely violent in character. Knowing these things many persons conclude that prevention is impossible.

In connection with the nature of the hazard, a second reason appears for statements similar to that quoted above. Because of the confusing manner in which storm names are used,[3] it is easy for many persons to assume that all storm winds have the characteristics of tornadoes. When a statement is made that "tornadoes cannot possibly be prevented" and "no building, of any practical use, can be built to withstand the violence of the wind in the vortex of a well developed tornado,"[4] its truth cannot be questioned. It is not quite correct to say, however, that there is "no possible way to guard against a tornado,"[5] because some efforts may be made to minimize the loss. Finally, it is extremely misleading to say that "against windstorm losses man is helpless."[6]

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[2] A supplement to the Aetna-izer, published by the Aetna Life Insurance Company, No. 37, p. 10.

[3] See p. 14.

[4] Ward, R. DeC., *Climates of the United States*, Ginn and Company, 1925, p. 357.

[5] Supplement to *Rough Notes*, March, 1925. See also *Eastern Underwriter*, April 20, 1928, p. 20.

[6] Krieger, W. M., Engineer, Fire Prevention Department, *The Modern Hospital*, Volume XXIV, No. 6, June 1925.

Conditions Tending to Increase Windstorm Losses

The existence of certain conditions tending to increase windstorm losses may be a third reason for the ideas mentioned above. As shown previously,[7] windstorms often occur over sufficiently large areas and with enough violence to have the effect of conflagration losses. In the event of such a catastrophe, conditions are generally present which tend to increase the loss. These must be considered in connection with any prevention program.

Fire often follows damage by a windstorm.[8] When this occurs numerous difficulties in preventing further loss may be encountered. Wind damage to the building may so impair the effectiveness of fire fighting equipment and other protective facilities that they become useless. Help may not be available because streets become blocked, water supplies cut off, and general alarm systems are out of commission.[9] In cases of very severe storms the stricken community may for a time be isolated and unable to obtain aid from the outside.[10]

Damage often occurs during a storm which is not the result of violent winds or fire which follows. Water damage in some form generally accompanies a storm. The presence of rain, hail, snow,

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[7] See Chapter, I.

[8] Data showing the frequency and severity of fires following windstorms are not available. Although the windstorm policy covers fire losses which follow windstorms (see p. 100), the companies in keeping their loss records do not distinguish between fire losses and windstorm losses. Individual instances of severe fire losses following windstorms are numerous. The fire may affect one building or a large area. The tornado which struck Murphysboro, Ill., on March 18, 1925, is a good example of the latter. This storm travelled about 200 miles over parts of three states causing damage of well over ten millions of dollars, most of which occurred in Murphysboro. In a special study of this storm made by the Inspection Department of the Associated Factory Mutual Fire Insurance Companies, it was stated: "Fire, which followed the storm, passed over much of the devastated area of Murphysboro, making it difficult in many places to judge what (damage) was done by wind alone." For a description of the fire hazard following the St. Louis tornado of September, 1927, see p. 128.

[9] The unreliability of overhead power lines and the flooding of power stations on the east coast of Florida during hurricanes in 1926 showed that electric pumps alone are unreliable for water service. *Cf. Factory Mutual Record*, No. 11, November, 1926.

[10] Immediately after the St. Louis tornado of Sept., 1927, local broadcasting stations, which were not in the path of the storm, were utilized in sending out calls for assistance. Where, however, the storm covers a large area, as was the case in the severe Florida hurricane in 1926, some communities may be isolated for days following the catastrophe.

or floods not only increases the direct damage but presents additional obstacles to salvaging of property and minimizing the loss.[11]

In some cases the time of day when the storm occurs may be a factor affecting the amount of loss which results. The occurrence of a storm during certain times of the day is likely to cause more loss than if it occurs at night because of the difference in the amount of property values exposed at the time.[12]

Possible Scope of Windstorm Loss Prevention Activities

Prevention activities in all fields may be of two general types. Efforts may be directed at eliminating the cause of the loss, or, if this cannot be done, steps may be taken to minimize the loss after the event occurs. In some fields of prevention, much has been done along both these lines. Through proper construction, the fire hazard has been all but eliminated. Where proper construction cannot be resorted to, the probability of the hazard occurring has been materially reduced through careful operation and frequent inspection of the property.[13] It is apparent, however, that in windstorm prevention there is no possible way to prevent the occurrence of a storm. Prevention of the first type, therefore, must be of a passive character.

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[11] The majority of windstorms are accompanied by water in some form. (See Ward, R. DeC., *op. cit.*, p. 344. See also Chapter I *infra*.) Water damage is covered by the windstorm policy under certain conditions (see p. 98) but as in the case of fire damage, the companies make no attempt to segregate water damage losses in the maintenance of their loss records. However, evidence of the importance of water damage is available. Much space in the standard policy is allotted to the subject. (See Chapter III). Rates are varied because of water damage. "Sea coast" territory has higher rates than "inland" territory. In the East, rates on contents of buildings occupied for mercantile purposes are higher than the rates for other contents which take the same rate as the building. (See Chapter V). According to the experience of the Associated Factory Mutual Companies, "damage to contents of buildings by rain constitutes a large proportion of the total in many instances." (See *Effects of Tornadoes on Factory Buildings*, Inspection Department, 1926, p. 9.)

[12] The St. Louis tornado of September 29, 1927, which occurred in early afternoon, caused damage of approximately $375,000 to over 2,400 motor vehicles most of which were parked and in service on the streets at the time. *Cf. Report of the St. Louis Tornado of September 29, 1927*, cited on p. 128.

[13] Much has been accomplished to prevent loss in credit, elevator, steam boiler, power plant, automobile and workmen's compensation insurance. See Kulp, C. A., *Casualty Insurance*, Ronald Press Company, 1928, p. 507.

The aim must be to so construct the building that a windstorm will not cause damage when it occurs. Accurate forecasting of storm winds would be of value, but only to a limited extent.[14] Notice of the approaching storm would allow for such steps as the protection of personal property by its removal to a place of safety and for the protection of real property by the closing of doors, windows, and by other similar preparations.

Efforts of the second type of prevention activities relating to minimizing the loss after it occurs may be of two kinds: those intended to reduce or stop the event after it has started and salvaging operations performed to reduce the loss after the event has taken place. As nothing can be done in the way of controlling a windstorm, all efforts at prevention, once the storm occurs, must be directed toward minimizing its effects. While much can be done along these lines, difficulties which have been referred to (factors tending to increase the loss)[15] must be overcome in order for preventive measures of this kind to be effective.

It seems obvious that prevention activities in the form of windstorm-proof construction, applied before the storm occurs, is the most fruitful of all windstorm loss prevention activities.

Progress Made in Windstorm Loss Prevention

Compared with the organized efforts to reduce fire loss, the efforts made to reduce windstorm loss have been negligible. Thus far there have been no organizations developed in the field to correspond with the National Fire Protective Association and the National Board of Fire Underwriters, both of which are leaders in fire prevention work throughout the country. Neither of these organizations has entered the field of windstorm loss prevention although some efforts toward prevention have been made in allied fields.[16] From this it is evident that the movement

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[14] Progress made in the forecasting of the weather is treated later. See p. 134.

[15] See p. 116.

[16] The National Fire Protective Association in a letter to the writer states that windstorm loss prevention is outside the scope of its work. Some studies, however, have been made in connection with explosion, lightning, flood, and

has not gone far enough to cause the passage of any important laws or the participation of such organizations as the Chamber of Commerce of the United States at Washington.[17]

From the foregoing statements, however, it should not be inferred that progress has not been made in the prevention of windstorm loss. While prevention activities prior to 1915 were sporadic and of little value, since that time and especially during the last decade, much has been done to promote progress in the field. What these achievements are and the measures used to accomplish them may best be presented by considering the prevention activities of each of the organizations prominent in the field. All organizations may be classified according to type into: insurance companies and their organizations; engineering, architectural, and other scientific bodies; and the work of the United States Weather Bureau. There are individual contributions, but these may be considered in connection with the field or organization with which the individual is associated.

Prevention Activities of Insurance Organizations

As might be expected, some insurance organizations have played a prominent part in windstorm loss prevention. The entry of the companies into the field is but natural since they are interested in reducing the total amount of losses they pay out. While the motive has a selfish basis, experience has shown that a reduction of the loss benefits the insured and the public as well as the company. If insurance were confined to its original purpose, the payment of losses, the insured would, even though recovering for the destruction of the property, suffer a loss of time, inconvenience, and possibly good-will if he is in business. Recovery for these intangible items is difficult. The nation is

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electricity and their bearing upon the fire hazard. The National Board of Fire Underwriters has included in its 1930 building code recommendations regarding the windstorm hazard. It has also given some study to the earthquake hazard in its relation to general fire protective problems and the conflagration hazard. It is possible that it may enter the windstorm field at some time in the near future for much the same reasons.

[17] Letter to the writer. Local chambers of commerce sometimes, following a storm, take preventive steps in the form of suggested building codes, improvements in city and other property, etc. Generally such activity ceases or becomes ineffective as the effects of the storm are forgotten.

better off if the property is left in existence. Finally, if the work is effectively done the insured should get the benefit of prevention in the way of reduced premiums. To all parties, therefore, the ideal would be the use of the premium in scientific prevention which would thereby eliminate loss.[18]

Naturally only those insurance companies which have sold windstorm insurance have been interested in the prevention of windstorm loss.[19] These include the stock fire insurance companies, the factory mutual companies, the farmers' mutual companies, including the state mutual windstorm companies and one reciprocal which has been organized for this purpose.[20] The prevention activities of these are discussed in the order mentioned.

1. *Stock Fire Insurance Companies*

Although the stock companies sell by far the greater part of the windstorm insurance in this country and are outstanding in certain other fields of loss prevention, their activities in the prevention of windstorm loss leaves much to be desired. With the exception of the Factory Insurance Association,[21] the companies do not have any organization which is active in windstorm loss prevention. This association operates along the same general lines as the Inspection Department of the Associated Factory Mutual Insurance Companies, which will be explained shortly. Because of the technical nature of the work, very little of its data on windstorm loss prevention has been prepared in a form which will permit of general distribution. The most effective work of the association thus far has been in the field of prevention of loss to buildings located throughout the hurricane area of the

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[18] See Huebner, S. S., *Modern Insurance Tendencies*, The Annals, The American Academy of Political and Social Science, March, 1927, p. v.

[19] See p. 70.

[20] See p. 86.

[21] This association composed of about 75 large stock companies with headquarters at Hartford, Conn. was organized by the stock companies for the purpose of giving the same inspection and follow-up service as that rendered by the factory mutual companies. It operates along the same general lines as these companies.

southeastern states.[22] Plans for proper bracing and bonding the parts of both new and existing buildings have been worked out and applied to risks insured against windstorm loss. Experience of the association has shown that in most cases damage occurs to the roof covering only and that where such covering is maintained in good condition, the loss may be eliminated or greatly reduced. It is recommended that roofs be well anchored, and when of timber or plank construction the planks be secured to the beam by at least two heavy nails in each plank. Much loss will be prevented by proper attention to flashing and surfacing so that they will not work loose from the roof deck, particularly near the cornices.

A number of the large stock fire insurance companies maintain "improved risk departments" with specially trained inspectors and engineers for the purpose of reducing the frequency and severity of all hazards covered by their insurance contracts. Even though the windstorm hazard cannot be reduced or controlled, the companies have found through study and experience that its severity may be greatly lessened by measures adopted toward that end. Trained employees of insurance companies are continually engaged in the inspection of windstorm risks. On new risks first-hand knowledge is obtained of all conditions which might be a factor in causing the company to accept or reject the risk. Unacceptable risks are often insured after suggested changes are made. If the risk is already insured an inspection may reveal conditions which when corrected will prevent a loss thereon. In such cases recommendations are made to the insured regarding changes in his property.

Windstorm loss prevention work is considered by the companies to be a necessary part of their underwriting business. No data are available regarding the profitableness of such activities.[23] Selfish motives have prompted the companies to enter the field and until evidence is presented to the contrary it seems safe to

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[22] Manufacturing risks located in Virginia, North Carolina, South Carolina, Georgia, and Alabama.

[23] Even if the companies were willing to supply the information, it would be extremely difficult, if not impossible, to obtain this data because the windstorm loss prevention work is not carried on by separate employees in separate departments.

presume that expenditures made in this manner are less than the money saved by losses which are prevented. It follows that until more efficient methods of windstorm loss prevention are found, the companies should be encouraged in the work.

2. *Associated Factory Mutual Fire Insurance Companies*

While the first object of this association is the prevention of loss by fire, much attention has been given to devising ways and means of reducing loss by windstorm. When the windstorm hazard was first assumed in 1913, it was realized that it might cause serious business interruptions and that efforts should be made to reduce the chance of loss. Since that time the combined experience of the companies has enabled their organization[24] to draw certain conclusions regarding preventive measures which are probably the most advanced in the field, especially from the insurance viewpoint.[25]

(a) Effects of Windstorms on Buildings[26]

Monolithic reinforced concrete structures are the most resistive of any type of building to windstorm damage. In no case has windstorm damage occurred to a major part of a building of this type of construction.[27]

Skeleton steel frame buildings when properly braced and tied together will resist very severe winds. Some damage may occur to roofing, glass and light-weight siding.

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[24] By organization is meant the Inspection Department of the 28 Associated Fire Insurance Companies. This department conducts the prevention work of the companies. It has a staff of over 350 persons, a well-equipped laboratory and the necessary facilities to conduct loss prevention research.

[25] These conclusions are based upon four publications of the Inspection Department of the Associated Factory Mutual Fire Insurance Companies: *Effects of Tornadoes on Buildings, 1926; St. Louis Tornado*, 1927 (a supplement to the first publication); *Windstorms—Windstorm Damage and Protection for Buildings and Cranes*, 1927; *Principles Determining Wind Hazard*, by C. K. Stiff, Engineer, Inspection Department, 1930.

[26] It should be remembered that the risks upon which the experience was obtained were factory buildings of a high type located in industrial centers throughout the United States and Canada.

[27] It is doubtful if this conclusion will hold for buildings of this type in the vortex of a tornado. Some of the Factory Mutual risks have been in the region of severe damage caused by tornadoes, but not directly in their paths.

Heavy timber construction with well anchored roofs and substantial walls and floors will withstand gales, hurricanes and minor tornadoes.[28] Severe tornadoes may cause much damage or destroy such construction.

Wooden-frame sheds and dwellings, covered with stucco or diagonal sheathing, although carried off the foundation, often hold together better than the light class of brick building and can be moved back again and made serviceable.

Flimsy and poorly built structures are a serious menace to nearby structures because of the possible damage by wind-blown debris.

Walls of brick laid in Portland Cement mortar will be much more wind resistive than when lime mortar is used. The walls should be well bonded and at least twelve inches thick.

Flat roofs resist tornadoes better than pitched ones.[29] Roof coverings are affected more than any other part of the building. The type of roof covering is extremely important. Wooden roofs are often damaged. They require good anchoring to masonry walls and interior columns. Overhanging cornices should be avoided but parapets on brick walls are of considerable value. A plank or reinforced-gypsum roof may be blown away without material damage to a steel roof frame. Light weight clay tiles are extremely susceptible to wind damage. Even though securely fastened, damage may occur by hail or flying debris.

Plain window glass and plate glass are likely to be broken by wind, hail, or flying debris. Setting the plate glass in deep, heavy, non-corrodible edgings will help it to resist damage. Proper bracing and, where practicable, division into small sections will also reduce the loss. Wire-glass used instead of plain glass will, even though damaged, remain in place and protect the contents of the building.

Structures such as skylight frames, smoke-stacks, ventilators, signs, and roof tanks are extremely suceptible to wind damage. Only through extreme care can such property be made windproof. Periodic examinations by competent inspectors and

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[28] For a definition of these terms see Chapter I.

[29] Tornado is here used in its technical sense as the most violent of windstorms.

immediate replacement of all defective parts is essential in this class of property.

The statements just made show the susceptibility of different types of structures and their parts to windstorm damage. A consideration of actual loss experience will aid in the formulation of preventive measures and at the same time, show where the emphasis in prevention work should be placed.

(b) Classification of Loss Experience

During the twelve-year period from 1913 to 1924, inclusive, the companies had a total of 562 windstorm claims which resulted in the payment of $916,942, or an average payment per claim of $1,672.[30]

The greatest single loss payment was $137,230. Most of this amount was paid for damage caused by rain to contents of the building. In only three cases did damage exceed one-quarter of the insured valuation.

Tornadoes caused 41 claims and loss payments of $351,524, or thirty-eight per cent of total claims paid. Average payment per claim was $8,574, but the variations from this were great. In 1924, twenty tornado claims occurred, resulting in losses paid of $224,250. Much of the damage caused by tornadoes occurred to main parts of the buildings, indicating that expensive construction would be necessary to resist this type of wind.

Thunderstorms caused seventy-nine claims but only $80,832 in total payments. The average payment per claim was $1,023. Thus while thunderstorm claims constituted fourteen per cent of total claims, loss payments were but nine per cent of total losses paid.

Other straight winds caused 442 claims and $484,586 in losses paid. The average payment per claim was $1,096. This group of claims constituted almost eight per cent of the total and over fifty-three per cent of all losses paid.

Losses due to thunderstorms, gales, hurricanes, and other straight winds exceeded sixty per cent of total losses paid. The greater portion of these losses may be avoided by proper

[30] See page 86 for average loss for later years.

preventive measures. Experience showed that severe winds of gale force were common throughout the greater part of the United States particularly in the northeastern section where the storms pass out to sea.[31] The distribution of thunderstorms and hurricane winds was similar to that pointed out in Chapter I.

Nearly a third of all damage paid for was caused by injury to wall and roof coverings, and to glass.

(c) Conclusions

Measures which should be embodied in any prevention program have been indicated in part by reciting the experience of the companies.

In general, the greater the unity of a structure, the more resistive it will be to windstorms. In new construction emphasis should be placed upon the use of good materials, adequate bracing, anchoring, and bonding of all parts of the building. Special attention should be given to seeing that roofs are well anchored, roof coverings are secure, and that there are no overhanging cornices. The window sashes should be strong and, if possible, wire glass used.

After construction a careful inspection and maintenance program is essential.

Many of these preventive measures may be applied to buildings already in existence without great expense. Proper changes in the roof, roof covering, and windows should more than pay for such expenditures by reductions in losses which would follow.

While it is probably not practicable to attempt construction of factory buildings to resist the most violent winds of the tornado, adoption of the measures outlined would materially reduce losses when the building is not directly in the storm's path.

3. *Prevention Activities of Mutual Companies*

Approximately thirteen per cent of farmers' mutual fire insurance companies and a number of district and state wind-

[31] See p. Ch. I for description of the storms referred to here.

storm mutual companies sell considerable windstorm insurance in certain parts of the United States.[32] The efforts made thus far by these companies to reduce their windstorm losses have been negligible. The great majority offer no effort at inspection[33] nor do they have any methods of classification of property. The insurance is sold either through a director of the company or an agent by the use of applications which must be filled out and sent to the home office. Most of the smaller companies have but one class of property and even in the case of the larger companies, there are generally not more than two. In one class will be found all barns, granaries, and similar farm buildings and in the other dwellings, mercantile and other city property. The rate for the first class is usually twice that for the second.

Until these companies adopt the principle of classifying their risks and charging a premium according to the nature of the risk assumed, their efforts to prevent losses will be greatly hindered. Proper classification not only is fairer to all policyholders because each pays in proportion to the protection received, but it is a means of indicating to the policy holder the importance of improving the risk insured.

The lack of initiative in prevention activities by mutual companies of this type seems to be due to their nature, history, and traditions.[34] Since their formation about one hundred years ago, these companies have continued to operate along the same general lines. Being mutual in plan, their aim has been to furnish protection at the lowest possible cost and anything which raises that cost is not looked upon with favor. Developments during late years show a tendency toward overcoming such ideas and it is believed the future will bring a gradual change with respect to the prevention activities of these companies.[35]

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[32] See p. 81.

[33] In the case of some large windstorm mutual companies, risks of a certain size and kind must be inspected before the insurance is issued. There is a trend toward yearly inspection for the fire hazard in the case of farmers' mutual fire companies.

[34] Valgren, V. N., *Farmers' Mutual Fire Insurance in the United States*, University of Chicago Press, 1924, Chapter V.

[35] See the *Proceedings and Papers* of the 33rd Annual Convention, National Association of Mutual Insurance Companies, pp. 59, 65.

4. *Tornado Inter-Insurance Exchange*[36]

Windstorm insurance is furnished by this Exchange, but the primary purpose is to provide an engineering service and to enlist the cooperation of its members in preventing windstorm loss to movable bridges and towers used in coal and iron ore dock handling operations. Operating along lines similar to the Factory Mutual Association, this Exchange has an engineering and inspection department through which prevention activities are carried out. A quarterly publication called "Loss Prevention" is issued for dock employees, and from time to time bulletins containing important information are sent to members.

The organization stresses constant supervision of the equipment by trained men, periodic inspections and great care in construction and maintenance. Compulsory rules for the care of bridges and foundations have been adopted.[37] No bridge or tower is to be moved if the wind exceeds thirty-five miles per hour. Adequate braking and anchoring equipment, which may be automatic or manual, must be installed and used as specified. Anchorage must meet the approval of the engineering department. A watchman service must be provided and reports made on the first and fifteenth of the month by the superintendent. Foundations must meet the approval of the engineering department and all recommendations by inspectors must be complied with.

The exchange has found that its prevention methods have been effective in reducing the loss on this class of property. Average annual cost to members including losses, prevention, and all other expenses since 1920, has been about forty cents per hundred dollars of insurance compared with a $2.00 stock rate in 1920.[38]

Technical and Scientific Prevention Studies[39]

As has been indicated thus far, the most effective measures in the reduction of windstorm losses have been those applied

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[36] See p. 86 for an explanation of the nature of this exchange.
[37] Copies of these rules are in the appendix.
[38] Letter from E. M. Heinselman, President.
[39] This heading is not intended to imply that windstorm loss prevention activities of insurance and other organizations is not scientific. It is used for lack of a better term to designate a somewhat different type of prevention work.

in the construction and maintenance of the property. It is natural, therefore, that those interested in the construction field would be concerned with problems presented by the windstorm hazard. The American Society of Civil Engineers, the American Institute of Steel Construction, and the American Institute of Architects have during recent years been active in sponsoring research in connection with pressures exerted by high winds.[40] Many individuals have also applied themselves to some phase of the field. While much of the research is highly technical, the nature and results may be referred to here.

1. *St. Louis Tornado of September 29, 1927*[41]

Shortly after the occurrence of this tornado a joint committee of engineers and architects was named from the Engineers' Club and the St. Louis Chapter of the American Institute of Architects "to investigate the structural lessons which might be learned from a study of the effects of the tornado which had recently devastated a large area of St. Louis." The total length of this storm was about twenty miles, of which eight were within the city limits of St. Louis. The path of the storm varied from three hundred to six thousand feet. Over two hundred blocks of property were damaged. Streets were blocked with parts of buildings, broken trees, fallen poles and wires, damaged automobiles, and other kinds of property. "The attending confusion . . . was increased by the fact that several of the principal arteries of street car and automobile traffic . . . were completely blocked and telephone service was interrupted to a very serious extent. A large number of important electric power lines were brought to earth and started a number of small fires. The Fire Department was obliged to work under the double disadvantage of delayed alarms and impassable streets but fortunately no serious damage from fire resulted, due primarily to the fact that the storm was followed by an unusual

[40] By recent years is meant since 1900 and especially during the last fifteen years.

[41] In 1896 St. Louis was struck by a tornado which destroyed property worth several millions of dollars. See the Annual Report of the Chief of the Weather Bureau, 1896.

downpour of rain and also because prevailing warm weather had postponed the starting of furnace fires in the houses."[42] The damage done by the storm was estimated at the time to be about twenty-five millions of dollars.[43]

The committee found that the tornado affected buildings in three different ways: by an explosive effect created when the tornado with its center of extremely low pressure passed by; the direct effect of the wind on each side of the vortex; and the effect of flying debris.

The explosive action within the buildings caused by a sudden lowering of atmospheric pressure around the outside caused the most severe damage. Many damaged buildings showed plainly the effects of explosive action. Roofs were removed intact, windows blown out and in poorly constructed buildings, walls were pushed out, causing the entire building to collapse. Metal garages were carried away and the automobiles left standing unharmed. There was evidence that the bursting of windows or other weak spots saved some buildings from further damage.[44]

Estimates placed the velocity of the wind at 400 to 500 miles per hour in this storm.[45] No construction of an economical type could withstand such a force. It was found, however, that on both sides of the path of the tornado, there was a zone in which winds of high velocity were encountered and that good construction would have reduced the loss in this area to probably less than one-fourth of that which actually occurred. By good construction is meant that which will withstand the wind pressures specified in an ordinary building code.[46]

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[42] Loss of life and number of injuries were small because the storm occurred about 1.10 p. m. when thousands of school children had just entered their classrooms following lunch and when most adults were in another part of the city not touched by the storm.

[43] See Table III for estimate of Weather Bureau concerning tornado losses in 1926.

[44] Efforts have been made to provide automatic vents in buildings and thus save them from explosive damage. The value of this, however, is questionable. See Teesdale, L. V., Engineer in Forest Products, *Tornado-Resistant Construction of Buildings Possible by Venting*, Published by United States Department of Agriculture, Washington, D. C.

[45] The wind velocity near the center of a well developed tornado has never been measured because the tremendous force of the wind has always destroyed the measuring equipment.

[46] See p. 133.

The damage done by flying debris was serious enough to warrant attention. Good construction and the elimination of temporary structures would have materially reduced such loss.

In concluding its report, the committee pointed out that every type of construction was located in the damaged area and that all kinds of building materials were represented. "Construction was good, bad and indifferent, with the indifferent predominating . . .[47] Of the well constructed buildings none was damaged materially and the evidences of the value of good construction were scattered throughout the area."

2. *Windstorm Damage to Tall Buildings*

In 1929, there were in the United States 4,778 buildings ten or more stories in height. These buildings were located in 131 of the 173 cities having more than 50,000 in population. 377 buildings with more than twenty stories were located in 36 different cities and 10 buildings had a height greater than 500 feet. Several other buildings in the course of construction were competing for the distinction of being the highest building in the world.[48]

This increased popularity of the skyscraper brings forth the question regarding its ability to resist the frequent high winds encountered throughout the greater part of the United States. Such a question must be answered by those in the construction field and from experience gained as a result of the severe storms which have occurred during recent years. The apparent trend toward even higher buildings further emphasizes the question because it is recognized that the higher the structure the more important the factor of wind pressure becomes in design and construction.[49]

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[47] The Director of Public Safety of St. Louis stated that the collapse of many buildings was due to faulty construction by contractors and building speculators. Many houses were built contrary to the building code. Hollow tile foundations and the use of half instead of whole bricks in the walls were common. See the *Weekly Underwriter*, November 5, 1927, p. 992.

[48] *The Skyscraper* for July 1929, published by Thompson-Starrett Company, Inc., quoted in Fleming, Robins, *Wind Stresses in Buildings*, John Wiley & Sons, 1930, p. 89.

[49] It is predicted that 100 story buildings will be constructed before long. Wind pressure is fast becoming the dominant factor in design. See Fleming, Robins, *op. cit.*, p. 126.

From the theoretical standpoint, the progress made in the study of wind-resistance in tall buildings has been far from satisfactory.[50] The modern tall building still "presents one of the most indeterminate structures in common use, as far as stresses produced by lateral forces are concerned, and the usual methods of calculating wind stresses are, at best, mere approximations."[51] It seems agreed that "a comprehensive study of wind-resistance is the first on the list of current structural problems.[52]

A number of reasons have been offered for such a situation.[53] The tall building, which is the object of study, is of comparatively recent origin. Furthermore the hazard itself is little understood. Even though the engineer understands its meteorological nature, the lack of proper data regarding true velocities of winds at various locations seriously hinders any attempt at the accurate calculation of wind stresses. Recordings of velocities at more places are needed. In the case of some present recordings of the Weather Bureau, the protection given the instruments by nearby high buildings take away much of their value. In this connection also, many published observations and reports of storms (by others than employees of the Weather Bureau) are not entirely reliable. They are often biased, tending to favor certain materials or types of construction and minimizing the value of others. Another reason is the lack of publicity in connection with data accumulated thus far. Designers are not willing to give out their methods and calculations, possibly because they fear criticism in some cases, and regard them as trade advantages in others. Finally, much could be done by a revision of building codes in our large cities. They not only vary widely in their requirements, but many are indefinite as to whether the specified wind pressure per square foot of exposed surface is to be carried by the steel frame alone, or by the frame plus walls, partitions, and floors.

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[50] Even if necessary, which it is not, the progress referred to is too technical and too lengthy to be reviewed here. If the reader desires to investigate the subject further, reference may be made to the works quoted.

[51] Ross, A. W. and Morris, Clyde T., *The Design of Tall Building Frames to Resist Wind*, Proceedings, American Society of Civil Engineers, May, 1928, p. 1395.

[52] *Engineering News-Record*, May 16, 1929, p. 776.

[53] Fleming, Robins, *op. cit.*, pp. 126, 127.

These reasons serve to give some idea of the present status of tall buildings with respect to problems presented in connection with wind pressure as a factor in construction. It should not be assumed, however, that because engineers have not arrived at an accurate but yet simple method of calculating wind stresses, the tall building in use today is unable to withstand severe wind pressure. While many tall buildings are located in cities where high winds are of infrequent occurrence and thus may stand for some time before receiving a real test, a number of high buildings have been located in storm areas where enough experience has been gained for at least tentative conclusions regarding their ability to withstand winds of high velocities. A review of this experience is instructive.

A number of tall buildings were in the direct path of the severe hurricane which passed over Florida on September 18, 1926. This is, without doubt, the most severe hurricane that has ever reached the United States. Over a large area the velocity of the wind ranged well over one hundred miles an hour. Only two out of approximately twenty-five of these tall buildings were seriously damaged by the storm. One swayed enough to crack seriously the brick work. The cause was evidently the inexperience of the designing engineer in connection with wind-stresses. The other, a seventeen-story building was so damaged that it was later condemned. Its walls and partitions were badly cracked and parts of the walls from the fifth to the tenth floors were entirely blown out. The structural steel framework was distorted between these floors. The cause in this case was attempted economy on the part of the owner by dispensing with an engineer.[54] The experience gained in the hurricane of September 1928 is similar to that of 1926.

High winds have occurred several times over New York City. On February 22, 1912, a velocity of ninety-five miles per hour was recorded by the Weather Bureau for a five-minute period. Again on March 7, 1929, the wind blew at the rate of sixty-two miles per hour. In neither case was there any serious damage done to

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[54] Clark, W. C. and Kingston, J. L., *The Skyscraper*, American Institute of Steel Construction, 1930, p. 112.

skyscrapers. The conclusions seem warranted that "with proper proportioning and design of connections, the usual wind pressure of thirty pounds per square foot will give a building with a sufficient factor of safety to withstand the most severe storms."[55]

With respect to the effect of the tornado on modern tall buildings experience has not been great enough to warrant a conclusion. The two severe tornadoes which struck St. Louis (one in 1896 and one in 1927) did not strike the business section. Considering what has been said before[56] about the severity of such winds, it is doubtful if any type of tall buildings can be economically built well enough to withstand the most severe tornadic winds.

3. *Windstorm Damage to Other Than Tall Buildings*

Of particular interest to the average property owner is the probable effects of severe straight winds upon dwellings and other small type structures. It is wind of this type that is most likely to be encountered by the average house owner. On this point, the experience gained in the Florida hurricane of September 1926 is invaluable because it was not only the most severe straight wind that has ever been experienced in the United States but it covered an area sufficiently large to include all types of construction. While reports of this storm are in many cases inaccurate or somewhat biased, the following conclusions seem warranted:

Well built structures, regardless of type or material, should withstand the most severe straight winds without serious damage. Records of the Florida storm showed that all types of structures

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[55] Morris, Clyde T., *Practical Design of Wind Bracing*, American Institute of Steel Construction, 1927, p. 12.

Note: The building code of New York City requires bracing to provide for a wind pressure of thirty pounds per square foot above the seventy-five foot level. This corresponds to a wind velocity to one hundred and twenty miles per hour. The ninety-five miles per hour mentioned above corresponds to a true velocity of seventy-four miles per hour and a pressure of sixteen pounds per square foot. After January 1, 1928, new anenometers were adopted by the Weather Bureau and the recordings since then are used without correction.

[56] See p. 128.

failed when proper care was not used in construction.[57] There was no evidence to show that some types are so weak as to be out of place in hurricane districts.[58]

Special care is necessary in the case of roofs, roof coverings, and windows. Much damage occurred to these parts in the Miami storm. Roofs were blown off, parapet walls blown over and windows blown out in almost all buildings. Good shutters would eliminate much window damage,[59] if properly closed when the storm occurs.

Forecasting Destructive Winds

Most destructive winds are associated with cyclonic or low pressure areas of either the tropical or extra-tropical type.[60] Tropical cyclones in the form of West Indian hurricanes affect the southeastern portion of the United States. Thunderstorms always accompany an extra-tropical cyclone with a v-shaped formation and tornadoes occur in connection with thunderstorm areas. The passage of extra-tropical cyclones and anti-cyclones across the United States determines to a large extent the condition of the weather at any one time.[61] Hence it is natural that the United States Weather Bureau should combine storm forecasting with its weather forecasting work.

1. *United States Weather Bureau*[62]

For daily forecasting purposes the Weather Bureau has divided the country into five districts with district centers at Washington, D. C., Chicago, New Orleans, Denver, and San Francisco.

Once each day and twice each day in case of domestic and some other stations, observations are reported by cable and

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[57] Much of the property loss in Florida was no doubt due to poor construction which took place in the boom period just prior to the storm.

[58] Schmitt, F. E., Editor, Engineering News-Record, quoted in Fleming, Robins, *op. cit.*, p. 23.

[59] Spellman, R. D., Structural Engineer in Miami Department of Building Construction, quoted in a bulletin issued by National Lumber Manufacturers Association.

[60] See Chapter I.

[61] Other factors such as local conditions may be important to the forecasting of weather but not in connection with destructive winds.

telegraph from about two hundred forty stations in the United States and Canada, seventeen places in Mexico, twenty in the West Indies, twelve Alaskan stations, and twenty-two European cities. This information is supplemented with reports by radio telegraphy from distant islands in the North Pacific, in the West Indies, ships at sea, China, Japan, Europe, and the Arctic regions.[63] Much of this information is sent to the forecast centers of each district and to other Weather Bureau stations by means of an ingenious "circuit" telegraph system. Based mainly upon these data, the forecaster at each center issues a prediction for his district shortly after such observations are received by telegraph. The morning forecasts are issued about nine a. m. and cover temperature, wind, and state of the weather for the next thirty-six hour period. The evening forecasts are for the following two days. Daily forecasts are made at most local stations for the nearby territory. Daily wireless forecasts are also made for the benefit of vessels along the Atlantic and Pacific coasts and in the Gulf of Mexico and the Caribbean Sea.

Weekly forecasts of general weather and temperature conditions are issued every Saturday for the following week which starts on Monday. These are made at the Washington office for each of nine districts into which the country is divided.

In connection with the daily wireless forecasts the district centers issue, when the occasion arises, storm warnings of hurricanes and high winds, cold waves, heavy snows, and floods. The warnings for storms and high winds are also displayed through the means of storm flags and lanterns at more than three hundred points on the Atlantic and Pacific Coasts, the Great Lakes and the Gulf of Mexico.[64] Reports received from the West Indies and Central America are valuable in this service as they greatly facilitate the forecasting of hurricanes. These warnings

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[62] See Milham, W. I., *Meteorology*, MacMillan Co., 1917. Chapters 7 and 8 for a detailed description of the history, organization, and work of the Weather Bureau. For a later work see Weber, Gustavus A., *The Weather Bureau, Its History, Activities and Organizations*, D. Appleton & Co., 1922.

[63] Calvert, E. B., *History of Radio in Relation to the Work of the Weather Bureau*, Monthly Weather Review, Volume 51, No. p. 5.

[64] The use of flags and lanterns is the old method. The advent of the radio has practically revolutionized storm warning work of the Weather Bureau. See Calvert, E. B., *op. cit.*, p. 1–9.

are extremely valuable to maritime interests. In most cases of storms affecting maritime interests the Bureau is able to issue warnings from twelve to twenty-four hours in advance.[65]

Forecasts of destructive winds are made for each particular area by observing the cyclones and anti-cyclones, their size, rate of movement and direction. In the greater part of the United States these storms travel from the West to the East. In the case of the hurricanes the route is different.[66] Forecasts of tornadoes are not made by the Bureau because the exact location of the storm cannot be foretold and therefore it would be necessary to alarm a very large area when the storm itself usually covers not more than a few hundred square miles at the most. When conditions appropriate to its occurrence exist in any given area a forecast is made warning of "severe local storms" or "severe thunderstorms."[67]

The accuracy of all forecasts issued by the United States Weather Bureau is between eighty and eighty-five per cent.[68] These figures, however, represent an average for the country as a whole. In some areas predictions are much easier than in others. Greater accuracy is attained in California, for example, than in the New England states where passing storms almost completely dominate the weather.

2. *Long Range Forecasting*

The great value of accurate long range predictions concerning the weather has led many persons to attempt such a performance. Numerous systems have been devised, some depending upon the movements of the planets, others on observations of plants,

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[65] *Weather Forecasting in the United States*, Weather Bureau, Washington, D. C., 1916, p. 33.

[66] See Chapter I.

[67] See Milham, W. I., *Meteorology*, MacMillan Co., 1912, p. 403. In this connection, S. D. Flora Meteorologist, United States Weather Bureau, Topeka, Kansas, says: "There is no way known to science to forecast the occurrence of a tornado for any particular time and locality or divert it from its path of destruction once it is under way." See *Hartford Agent*, Volume XIX, No. 9, March, 1928, p. 194.

[68] See Milham, *op. cit.*, p. 407.

animals, etc., and still others based upon meteorological data in the form of means, deviations, etc. in the weather.[69]

A few meteorologists have attempted long range forecasting and the results of these have, in general, turned out to be unsatisfactory.[70] The United States Weather Bureau has never attempted forecasts for a longer period than one week and these do not cover the field of destructive winds. Under our present state of knowledge predictions for a period longer than several days would be largely guesswork. Any advance in the period and accuracy of weather forecasts must come from increased knowledge of atmospheric pressure changes and distributions over greater areas of the earth.[71]

Conclusions Regarding Prevention

Combined experience gained in connection with windstorm losses warrants certain tentative conclusions regarding the value of preventive measures:

Much can be done to reduce windstorm loss, even in the areas where the hazard is greatest. The preventive measures to be taken resolve themselves largely into measures connected with the proper design and construction of buildings. Only in the case of the winds in the vortex of the tornado are such efforts of doubtful value.

Prevention of windstorm losses being largely a matter of construction, progress will depend upon the attainments of those in the engineering and architectural fields, and the willingness of property owners to adopt the necessary corrective measures. Sufficient advances have already been made in the field of construction to permit relatively safe buildings to be economically constructed. Existing property may present problems in that prevention might in some cases, mean costly changes necessary to make the property safe. In these cases, however, minor changes

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[69] For a classified list of long range forecasting systems and a discussion of their merits, see Milham, W. I., *op. cit.*, p. 416. Also, Bowie, Edward H. in *Weather Forecasting in the United States*, Weather Bureau, 1916, p. 341.

[70] See Brooks, C. F., *Performances in Long Range Forecasting*, Monthly Weather Review, September, 1927, p. 390.

[71] Bowie, E. H., *op. cit.*, p. 343.

such as proper anchorage of roofs, good shutters, etc., may materially reduce the loss.

Difficulties are encountered in educating owners to build properly. In all areas proper building codes should be adopted and enforced. In areas such as Florida, where the hazard is great, the police powers should be used to compel people to abide by certain regulations. Roofs, tanks on roofs, signs, and similar objects should be inspected frequently to determine their safety. Special precautions ought to be taken with lumber piles, scaffolding, and weak structures. In case of storm, measures of this kind would help prevent blocking of the streets with debris and thus permit more efficient operation by fire, police, and public health bureaus.[72]

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[72] *Palm Beach Post* Editorial in *Weekly Underwriter*, September 20, 1930, p. 632.

V

Rates and Rate Factors

The premium for windstorm insurance is the charge made by the insuring company for the protection granted. In the case of a mutual windstorm company it is a membership fee of, say one dollar, together with fifteen cents for each one hundred dollars of insurance and liability for an assessment thereafter. In the case of the Associated Factory Mutual Companies, it is a redundant premium, most of which is returned at the end of the period. The stock fire insurance companies charge premiums based upon a "rate" or so much per hundred dollars of protection granted. Because the stock companies rank far ahead of the other types of companies in premiums collected each year, their "rates" will be considered here.

Windstorm rates of stock companies are controlled, as far as the laws in the various states permit, by the four large sectional underwriters associations previously described.[1] There follows a description of the rate structure in each of the four sections of the country. Such a description provides the necessary basis for a discussion of the problems involved in the making of windstorm rates.

Rates in Eastern Territory[2]

The Eastern Tornado Association makes, promulgates, and furnishes rates directly to companies, agents and brokers for eastern territory. With two exceptions, all rates are of the minimum or class type.[3] The two exceptions, movable marine legs of grain elevators and movable coal, ore, and stone handling apparatus, are rated by schedule.[4] When a risk is covered for

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[1] See p. 66.

[2] New England and Middle Atlantic states, including New York, District of Columbia, and West Virginia. See p. 73.

[3] Rates of this type are called either minimum, class or tariff rates, depending upon the section of the country where they are used.

[4] The association has been rating these types of property by the Analytic System since 1924 and 1925, respectively. The association delegates its schedule rating work to local fire insurance rate-making organizations in the territory where the risk is located.

which no rate has been issued (either minimum or specific) it may be written at a temporary rate for a term not to exceed one year.

Prior to 1928 the association had a "rate sheet", containing twenty-two classes of property with rates for about seventy classes and sub-classes. The manual adopted in 1928 contains thirty-seven main classes with one hundred thirty-six rates for different classes and sub-classes of property. The following shows the more important classes of property with the number of such classes listed in the manual, and the low and high rates in each class:

1. Bridges—seven classes	
Concrete or other Masonry	$0.06
Wood skeleton frame, wood covered	.75
2. Builder's Risks—seven classes—	
Fire resistive, in course of construction, excluding contractors' equipment	.10
Wood skeleton frame, wood covered	.75
3. Churches—six classes—	
Fire resistive, without steeples	.06
Frame, with steeples	.20
4. Farm Property—twelve classes—	
Dwellings	.20
Hay barracks when covered without $50 loss deductible clause	3.25
5. Grain Elevators—seven classes—	
Fire resistive, without movable marine legs	.06
Frame or iron-clad, with movable marine legs, excluding legs	1.00
6. Hotels—Resort—three classes—	
Fire-resistant	.75
Frame	2.00
7. Mortgagee Interest—two classes—	
Covering 1st mortgages	.04
Covering 2nd mortgages	.06
8. Mercantile Stocks—one class	
To obtain rate on stocks in buildings occupied in whole or in part for mercantile purposes, increase building rate (given in item 9)	.04

One class of risks, not mentioned above, serves to show the extent to which the subdivision of classes has been carried:

9. Buildings and/or contents of buildings (unless rate otherwise specifically provided hereunder for a specific class):[5]

(a) Brick,[6] not over 4 stories in height, located adjacent to and protected by contiguous buildings in blocks or rows, or if not so situated and protected, not over 10,000 square feet in ground floor area, or if area broken by interior division walls of brick or other masonry extending through roof, not over 10,000 square feet in ground floor area in any one subdivision..... .06

NOTE: The absence of standard cut-off for openings in division walls does not remove a risk from this class.

When not so located and protected and of more than 10,000 square feet in ground floor area, charge for:

1. Brick—ordinary construction..... .14
2. Brick—mill construction or with plant roofs and floors on steel supports..... .12

(b) Frame, not over 3 stories in height, located adjacent to and protected by contiguous buildings in blocks or rows, or if not so situated and protected, not over 10,000 square feet in ground floor area..... .08

When not so located and protected and more than 10,000 square feet in ground floor area, charge for:

1. Frame—ordinary construction..... .20
2. Frame—framing mill construction with plant roof and floors or with plant roof and floors on steel supports..... .16

(c) Fire-resistive buildings (permanently enclosed on all sides).... .04

(d) Fire-resistive buildings (permanently enclosed on all sides) of steel skeleton frame with corrugated iron or steel roof and

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[5] Buildings specifically provided for not mentioned above and, therefore, not coming within this class are: coal breakers, tipples and washeries, coal yards, glass works, grandstands, hot houses, ice houses, rolling mills, saw, stave and shingle mills, and sheds.

[6] The words brick, frame and fire-resistive mean:

Brick: Buildings (not of fire-resistive construction) with exterior walls of brick, reinforced concrete, stone, hard-burned hollow brick, interlocking tile and/or steel skeleton frame iron-clad buildings.

Frame: Buildings with exterior walls of frame or other combustible material, corrugated-iron on wood sheathing or skeleton wood frame, brick veneer, cement block, terra cotta or ordinary tile (not interlocking).

Fire-resistive: Buildings of reinforced concrete construction throughout, or steel skeleton frame, with exterior walls of brick, stone, reinforced concrete, hard-burned hollow brick and/or interlocking tile, with floors, roof and their supports of non-combustible construction.

siding and non-combustible floors, over 10,000 square feet in ground-floor areas, and not over 1 story in height..... .10

NOTE: (a) If height of building exceeds standard for height, add for each additional story in height under a and b (not exceeding a charge of six (6) cents, two (2) cents. (b) If building is without intersecting floors, increase rate under a, b, and d, four (4) cents if height exceeds 1 story equal to 2, or more than thirty (30) feet in height measured between top of sill and eave of roof.

As indicated in items eight and nine, all contents of buildings, except mercantile stocks, take the same rate as the building in which the contents are located.

The following risks, if located within one-quarter of a mile of the shore front of ocean or Great Lakes (including bays or sounds unless landlocked) and without protection from contiguous buildings in blocks or rows acting as wind breaks, are subject to the following increases in rates: Buildings and/or contents, 6 cents; builders risks, 25 cents; churches, 6 cents; hotels—resort, 10 cents; mortgagee interest, 4 cents. The increases named are flat amounts applying to all the sub-divisions in each class.

All rates (except specific rates)[7] are based upon the use of a 50 per cent coinsurance clause. If the insured takes out an amount of insurance which is less than the required amount (50 per cent) any loss occurring will be paid in the proportion that the amount he carries bears to the required amount or 50 per cent of his value. The following reductions are made in the rate if he takes out 75 per cent or more insurance to value:

For 75% insurance to values.....22% reduction
For 80% insurance to values.....25% reduction
For 90% insurance to values.....30% reduction
For 100% insurance to values.....35% reduction

The rules provide for the attachment of a "hail damage clause" to the tornado policy if the insured desires such coverage and is willing to pay additional rate of five or ten cents, depending upon

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[7] *Specific* rate as used in the manual means a rate obtained by the application of a schedule. The word *schedule* is often applied to the classes of risks and their respective rates, and it is in this sense that it is generally used in windstorm insurance. See footn ote (11).

whether the amount of exposed surface in the form of glass is less or greater than 50 per cent of all exposed surface. Growing crops, trees, and shrubbery are not insured against hail damage under the tornado policy. Greenhouses and hothouses are insured against hail loss at rates ranging up to $3.00.

A $50 loss deductible clause may be used to secure a lower rate on barns and hay barracks if the insured so desires.

Cancellations of policies and policies written for periods shorter than one year are governed by the rules and the short rate tables prevailing in fire insurance.

Rates in Middle Western Territory[8]

Windstorm rates for the Middle West are furnished to the companies and agents by the various state rating bureaus.[9] Such rates and the rules and forms for writing the business are included in the manuals containing rates and rules pertaining to the writing of fire and lightning insurance.[10] In principle the rating structure is the same as that described for the East. That is, all property is divided into classes, a few of which are rated by schedule. The great majority of the risks have flat or minimum rates. There are, however, several differences between the rates in the East and in the Middle West and these are worth noting.

The farm business in the Middle West is of sufficient importance to warrant the issuance of "farm property schedules."[11] These schedules are printed separately from the other rules and contain rates and rules governing fire, lightning, and wind-

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[8] This territory comprises 18 states. See p. 73.

[9] Many states have passed laws requiring fire insurance companies to subscribe to and abide by the rules and rates of an approved rating bureau. Other states permit such cooperative action. (See Reigel, Robert, *The Regulation of Fire Insurance Rates*, The Annals, The American Academy of Political and Social Science, March 1927, p. 114.) Some of these laws apply directly, others indirectly, to the windstorm insurance business. See p. 74. The Western Actuarial Bureau, Chicago, is often consulted by state rating bureaus and company officials regarding windstorm rates.

[10] The manual referred to here is called by different names in different states. In Indiana it is a "rule book", in Oklahoma, a "general basis schedule", and in Illinois, an "advisory rule book", on the Pacific Coast, "tariff rules", etc.

[11] "Schedules" here means classes of property.

storm business.[12] Rates on farm property vary with the class of property and the manner of paying for the insurance, i. e., by cash or installments. For example, the rate in Michigan for all farm property (not fruit farms) when the premium is paid in cash is 50 cents for one year, 75 cents for three years, and $1.00 for five years.[13] Hail protection written in connection with the windstorm policy costs 10 cents for one year; 20 cents for 3 years, and 30 cents for 5 years. When the windstorm coverage is combined with fire and lightning coverage, the combined rate is somewhat cheaper than if the fire and windstorm policies are taken separately. A reduction of this combined rate is offered if the building is of brick, stone, or hollow tile. No reduction in the windstorm rate is given for the better types of construction, although it seems some credit should be allowed.

Property risks in the Middle West are divided into fewer main classes than in the East. Including classes rated by schedule, the number ranges from eleven to fourteen for the different states as compared with thirty-seven classes in the Eastern manual. Naturally with a much smaller number of classes, the property included in each consists of many different kinds. The following classes and their rates as given for Michigan are typical of practically all Mid-Western territory:[14]

1. Amusement parks, baseball and fair-ground buildings, cotton compresses (open) and all other structures similarly occupied or not entirely enclosed; bridges, covered or enclosed; display signs when written under specific item (for exceptions, see Note 3 below); elevated tanks not on roof of building; hay barns and warehouses (commercial); lead and zinc mine hoisting houses and mill buildings containing hoisting houses (except tramways and flumes); waterworks standpipes:

   Ordinary construction.....$0.80

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[12] Stock companies have formed a "Farm Association" in order to get the benefits of cooperation in the solution of problems in this field. In general their farm windstorm business experience has not been satisfactory. For statistics regarding premiums and losses in each of fourteen Middle Western states over a five-year period, see the *National Underwriter*, April 1, 1928, p. 28.

[13] Farm schedule, effective on April 16, 1928, issued by the Michigan Inspection Bureau, Detroit. Windstorm rates on farm property vary between states, being higher in the Dakotas than elsewhere.

[14] Rule Book, Michigan Inspection Bureau, pp. 72–79A.

Fireproof (all steel work protected) or superior wind-resistive construction, and so certified by the Michigan Inspection Bureau..... .60

NOTE 1: No provision for superior wind-resistive construction on bridges, display signs (except as otherwise provided for in Note 3 below), elevated tanks and waterworks standpipes.

Note 2: When amusement parks, baseball and fair ground buildings are entirely enclosed and of good substantial construction, specific rates must be published by the Michigan Inspection Bureau.

Note 3: Display signs may be written with the building and at the tornado rate applying to the building, if the property of the owner of the building.

2. Buildings occupied exclusively as dwellings (single or duplex), chapter, fraternity and sorority houses; private boarding and/or rooming houses, nurses' and sisters' homes, containing not more than twenty rooms; flats, terraces, tenements and apartments containing less than three family apartments (excluding janitor's apartment); and private barns and garages in connection with same:
   All classes of construction..... .16
3. All other classes of risks entirely covered and enclosed; bridges not covered or enclosed; masonry smoke stacks; tanks, concrete, tile or steel (not elevated):
   Ordinary construction..... .20
   Fireproof (all steel work protected) or superior wind-resistive construction, and so certified by the Michigan Inspection Bureau..... .12

Rates, rules and forms for windstorm insurance are surprisingly uniform throughout Middle-Western territory. The first two of the above three classes may be used to illustrate this uniformity. For sixteen states,[15] the risks listed in the first class are practically the same in all states and the rates are similar in twelve. Missouri and Oklahoma have higher rates of $1.00 for ordinary and 80 cents for fireproof construction. The rates in Kansas are 90 and 72 cents respectively. Kentucky's rates are 12½ per cent higher than those quoted above. With respect to the second item, the rates on dwellings, etc., are the same in thirteen states. In Oklahoma, the rate is 20 cents; in Kentucky, 18 cents; and in Wisconsin, 14 cents. All items of property are not treated

[15] Ohio, Michigan, Illinois, North Dakota, Missouri, Tennessee, Iowa, Kansas, South Dakota, Nebraska, Minnesota, Indiana, Wisconsin, Oklahoma, Kentucky, and Colorado.

as uniformly as those just cited, but in general, the variation in any item of importance is not great.

Hail damage is assumed as in the East by attaching a hail damage clause. The rate is four cents on dwellings (see class 2 above), and five cents on all other classes of property excepting greenhouses and farms.

Rates for Middle-western territory are not based upon the use of a coinsurance clause.[16] However, deductions from quoted rates are authorized when a 50 per cent or higher coinsurance clause is used. Such credits do not apply to dwellings and farm property. For the use of the 50 per cent clause, the deduction is 60 per cent on fireproof and 30 per cent on ordinary construction. For a 90 per cent clause, the percentage reductions are 70 per cent and 55 per cent, respectively. These percentage reductions[17] are used in all states except two. Kansas and Missouri have reductions somewhat lower than the rest.

Rates In Southern Territory[18]

Windstorm rates are promulgated for Southern Territory by the Southern Tornado Association. As in the Middle West, these rates (also rules and forms) are furnished to the agents and companies by state rating bureaus.[19] The rate structure in this territory resembles somewhat that adopted by the Eastern Tornado Association. There are thirty-one main classes with approximately fifty sub-classes for which rates are quoted. These classes and sub-classes are uniform in all states. The rates, however, vary between states and between inland and coast territory. The following classes and rates are representative and may be compared with the rates for the East because

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[16] The reasons for this seem to be the existence of anti-coinsurance laws in many states of the Middle West and the controversy which arose over the adoption of the coinsurance principle during the early years of the business. On this latter point, see p. 65.

[17] There are reductions for the 60, 70, and 80 percent clauses.

[18] Virginia, North Carolina, South Carolina, Georgia, Louisiana, Florida, Texas, Mississippi, and Alabama.

[19] In Texas and Mississippi the state bureaus have no functions relating to the windstorm business.

in both territories, rates are based upon a minimum coinsurance requirement of 50 per cent insurance to values:[20]

	INLAND RATES[21]			
	FLA.	LA.	ALA. GA.	N. C. VA.
1. Bridges, 4 classes:				
Reinforced concrete throughout..	.25	.10	.10	.08
Old style covered—wood.....	2.50	1.00	1.00	.80
2. Churches—2 classes:				
With steeples or towers.....	1.80	.75	.75	.60
Without steeples or towers.....	1.00	.40	.40	.30
3. Dwellings, including barns, stables, and garages—but not farm property.....	.60	.20	.20	.15
4. Farm Property, including dwellings, barns, and outbuildings, and contents, but not silos.....	.75	.30	.30	.25
5. Grain elevators—2 classes:				
Reinforced concrete—and contents	.30	.15	.15	.12
6. Hotels—see next class.....				
7. All other buildings—entirely enclosed, not above specifically rated, shall rate as follows:[22]				

	(Florida only) Ground Area		
	UNDER 10,000 SQ. FT.	10,000 SQ. FT. BUT UNDER 20,000 SQ. FT.	20,000 SQ. FT. AND OVER
(a) frame.....	.75	1.50	2.20
(b) brick.....	.60	1.25	1.80
(c) mill constructed.....	.50	.75	1.00
(1) contents—same as building rate.			
(d) Buildings—specially well constructed, permanently enclosed on all sides, or steel or iron skeleton frame with brick, stone or solid concrete walls, floors and roof; or of reinforced concrete throughout.....			.25
(1) contents.....			.40

[20] In the South the coinsurance principle is not applied to farm property. In the East it is. Also, the credits allowed for larger amounts of insurance than the required 50 per cent of values are different from those in the East. For the use of 60, 70, 80, and 90 per cent coinsurance clauses, credits of 10, 15, 20, and 25 per cent respectively are allowed.

[21] In each of the above states the rates in the "seacoast" territory average higher than inland rates as follows: Florida, 50 per cent; Louisiana, 50–100 per cent; Alabama and Georgia, 150 per cent in most cases; Virginia and North Carolina, 80–100 per cent in most cases. "Seacoast" territory is defined in all states by the enumeration of specific counties.

[22] "Not above specifically rated" means the entire manual and not the few classes listed here as representative. Note that dwellings do not come within this class as in the East. See p. 140.

The use of some clause to protect the company against small losses is common throughout the South. In Florida, the rates are based upon the attachment of a $100 deductible clause to policies sold in counties in the seacoast area.[23] In all other counties a $50 deductible clause must be used. Should the insured desire it, the deductible clause will be omitted from the policy upon the payment of a rate equal to a 50 per cent increase over those quoted. In all other states except Florida, a twenty-five dollar limitation clause is required.[24] Rates are based upon the use of this clause, but it will be omitted if the insured is charged a 20 per cent increase in the rate which applies. Neither the deductible nor the limitation clause applies to the coverage extended under a hail damage clause attached to the windstorm policy.

Rates in Pacific Coast Territory

The states in this territory may be divided into two groups, with a different rate classification in each group. In California, Nevada, Utah, Montana, and Washington, the classifications are the same. Furthermore, the classification used is, with one exception,[25] the same as that which has been adopted in most states in the Middle West.[26] The rates vary but little between these different states and are, in general, lower than those in Middle Western territory. In California, Nevada, and Washington, like rates prevail throughout the twelve main classes into which all property is divided. Farm property (which has no special schedule as in the Middle West) is divided into two classes, stave and/or metal silos and all other property. The rate on the second class is 40 cents per hundred of insurance, regardless of

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[23] There are 35 of these counties in Florida and a large number in the other states.

[24] The clause reads: "It is a condition of this contract, that there shall be no liability for loss or damage by any one windstorm, unless after adjustment, according to the terms, conditions and limitations of this insurance, such loss and damage to the interest of the insured in the within-described property shall be found to exceed Twenty-five dollars ($25.00).

[25] In these Pacific states, a separate class is set up for grain elevators and flour mills and given a somewhat lower rate than the class to which they are ordinarily assigned.

[26] See p. 143.

kind and location of the property. Amusement parks, fair grounds, cotton compresses (open), bridges, covered or enclosed, elevated tanks not on the roof, etc., have a rate of 60 cents for ordinary and 45 cents for fireproof construction. Lumber yards, sheds, coal shafts, tipples, etc., are assigned a blanket rate of 30 cents per hundred. Dwellings and similar property have a rate of 12 cents. The rates are the same for Utah and Montana, averaging from 25 to 33 1/3 per cent higher than those in California, Nevada, and Washington.

In Arizona, Idaho, and Oregon there are but eight classes of risks, which are uniform throughout the three states. This necessitates a different grouping of risks in the various classes as compared with the classification described for other Pacific territory and elsewhere. Rates are the same in Arizona and Idaho. Farm property, other than stave and/or metal silos has a rate of 50 cents; amusement parks, fairgrounds, etc., $1.00 for ordinary and 80 cents for fireproof construction; dwellings and similar property, all classes of construction, 16 cents. In Oregon the rates average about one-third lower.

The rates in Arizona, Idaho, and Oregon are quoted upon the assumption that a reduced rate average clause (coinsurance) of at least 50 per cent will be attached to all policies. Reductions are allowed for the use of a 50 per cent or higher coinsurance clause on all classes of risks, except farm and dwellings.[27] More credit is allowed in the case of fireproof than is allowed for ordinary construction. In California, Nevada, Utah, Montana, and Washington, the rates are not based upon the use of a coinsurance clause. However, for all property except farm and dwellings, credits are allowed for the attachment of a 50 per cent or higher clause to the policy. The credits correspond to those used in the Middle Western territory.

Rate Factors

An analysis of the rate structures for each of the four sections of the country reveals that rates charged in the underwriting of

[27] The credits allowed for ordinary construction range from 20 per cent for the 50 per cent clause to 64% for the 90 per cent clause.

buildings take into account: (a) the location, (b) the construction, (c) the area, (d) the coinsurance requirement, and (e) the special clauses attached to the policy. In no two sections, however, are the practices uniform with regard to these factors.

1. *Location*

The rates promulgated for the East provide for the factor of location, but only to a limited extent. Certain risks[28] are charged higher rates if they are located within one-quarter of a mile of the ocean and if they do not have the protection of contiguous buildings in blocks or rows acting as windbreaks. In the South higher rates are charged for all property located in "seacoast" territory.[29] The principle of varying rates according to location of the risk is also recognized for inland territory, to the extent that rates in some states are uniformly higher (or lower) than in others.[30] In the Middle West and on the Pacific Coast there is some variation in rates between states, but throughout most of this territory uniformity predominates.[31]

An insurance rate should measure the frequency and the severity of the hazard insured against.[32] In Chapter I it was shown that both the frequency and severity of destructive winds vary with location. The question arises, therefore, as to whether or not enough consideration has been given to the factor of location in the making of windstorm rates. This question is difficult to answer. In the East the chief reason for the little weight given the factor seems to be the relative unimportance of the hazard and the resulting small volume of premiums collected each year. It was not until 1927 that premiums collected in Eastern territory exceeded $1,000,000 per year.[33] In 1924, premiums collected amounted to $678,648. For a five-year period (1924–1928), total premiums collected in four states,

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[28] See p. 142 for an enumeration of these risks.
[29] See p, 147.
[30] See pp. 146, 147.
[31] See p. 145.
[32] See p. 11.
[33] As reported by association members to the Insurance Department of the State of New York.

Maine, New Hampshire, Rhode Island and Vermont, amounted to less than $100,000.[34] With such a small volume of premiums over these and the other states of the East, it is doubtful if any further allowance in the rates should be made for the factor of location.[35] The business is more important in the South. Premiums collected by association members during recent years have amounted to more than $7,000,000 per year. In most of the Southern states, straight winds which cover large areas cause more damage than tornadoes.[36] Since rates are varied now according to state boundaries and for seacoast and inland territory, no reasons can be found which justify further variations for location.

In the Middle West, windstorm insurance is more important than elsewhere. Premiums collected in this territory are greater than $30,000,000 per year.[37] Variations in rates in this territory for location are surprisingly small considering the eighteen states covered.[38] The principal reason offered for this condition may be expressed in the words of a leading authority on rates in the Middle West:

> "There is a serious question as to whether or not windstorm insurance should be based on individual state experience because the paths of many of our larger storms in this Middle West cover sometimes two to eleven states in a single storm, and therefore, the tendency has been to keep the rates as uniform as possible throughout the entire territory regardless of individual state experience. This has the effect of enabling the business to absorb the larger disasters without unduly disturbing the business."

The importance of sweeping storms is recognized. Evidence presented previously,[39] however, tends to show that the different kinds of storms vary greatly as to frequency and severity between states. This results in more property loss in some states than in others. An examination of Table V.[40] shows that not only

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[34] See p. 160.
[35] See p. 159 for available data regarding premiums and losses for this territory.
[36] See Table V, p. 50.
[37] See p. 160.
[38] See p. 145.
[39] Chapter I.
[40] See p. 50.

is the loss greater in some states than in others, but that in Illinois, Missouri, Indiana, Iowa, Kansas, Minnesota, Ohio, Arkansas, Michigan, and Nebraska, the losses due to tornadoes exceed by substantial amounts the losses due to other kinds of winds. Tornadoes sometimes travel across one to three states[41] and often the conditions when propitious, produce a number of tornadoes in the same part of the state or in an area covering parts of several states. In spite of these things, however, tornadoes are predominatingly small area storms. Even when they extend over unprecedented length, their paths are narrow. It seems, therefore, that there is enough climatological evidence showing variations in the hazard between states to place the burden upon the companies to justify present rates in this area. The extent to which this can be done at present is doubtful, since the necessary data is not kept by insurance companies.[42]

2. *Construction and Area*

Type of construction is recognized in the East as a factor in rate-making. Rates are different for frame, brick, and fire-

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[41] See p. 116.

[42] See p. 159 for a statement of the experience data available. In connection with the change in the hazard with change in location, mention should be made of the work of Colonel John P. Finley, U. S. Army, Retired. Colonel Finley in 1920 organized the National Storm Insurance Bureau with headquarters in New York City (now the National Storm and Aviation Insurance Bureau) for the purpose of furnishing an independent rating service covering all the weather hazards. Colonel Finley has had over 40 years of service with the U. S. Signal Corps of the Army and the U. S. Weather Bureau. His bureau offers its service for rating risks in any part of the country. Dependence is placed primarily upon climatological data gathered from other sources to supplement the records of the U. S. Weather Bureau. From this data gathered over a period of many years, the bureau finds the frequency and severity of the hazard for areas as small as counties and even townships in some cases. Through cartographical treatment, storm distribution may be shown in the form of storm paths in each of the states and counties. The theory of this system of rating is just the opposite that underlying the rates now in force, which in many cases cover a number of states. Colonel Finley claims that if the records cover a sufficiently long period, the hazard will be definitely known, and that the exceptional and "freak" storms which occur need not be feared by the rate-maker. It should be noted that the state boundary lines have no bearing on the rate under this system. In fact, there may be many different rates for like risks within the same state, depending upon the change in hazard with location.

resistive structures.[43] In the South an additional type, "mill construction" is recognized. In the Middle West and on the Pacific Coast but two types are considered, ordinary and fireproof construction. Area affects the rate in the East, the rate being increased for each 10,000 square feet of ground floor area without supporting walls. In this territory, height is a factor, also, buildings higher than the standard having increased rates. The unit of ground floor area is recognized in the South but not in the Middle West or on the Pacific Coast.[44] Height is not a factor, except in the East.[45]

The extent to which rates are varied for type of construction seems to conflict with much of what was said in Chapter IV regarding the susceptibility of buildings to damage by destructive winds. On page 134 it was stated that "there was no evidence to show that some types (of construction) are so weak as to be out of place in hurricane districts." Again on page 130, regarding the effects of the St. Louis tornado of September 1927: "of the well constructed buildings none was damaged materially and the evidences of the value of good construction were scattered throughout the area." On the other hand, the experience of the Associated Factory Mutual Companies (see p. 122) and the damage suffered by skyscrapers in the Florida hurricanes (p. 132) tend to confirm the contention that loss varies with the type of building. Even there, however, much emphasis was placed upon the use of good materials, adequate bracing and bonding of all parts of the building. The conclusion seems to be that there is no great variation in the susceptibility of different types of buildings *if* good materials have been used and proper care has been taken in their construction. Actually, however, many grades of material are used and many buildings are poorly

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[43] Farm property is an exception although even here a distinction is made between dwellings, barns, etc. See p. 140.

[44] Area is considered in some classes in the Middle West and on the Pacific Coast. Lumber yards, sheds, cotton compresses and similar buildings "when of unusually large area . . . should be estimated as the particular conditions warrant . . ."

[45] In a sense the construction, area and height of a building is considered when the building is placed in a particular class and assigned a certain rate. These factors are not considered individually, however, but rather as a whole in connection with the susceptibility of the buiding to windstorm damage.

constructed. As a result, the susceptibility of buildings to windstorm damage varies greatly. The stock companies insure all kinds of buildings. In general, their loss experience as shown in Tables IX and X justifies variations in rates for types of construction. The extent of the variations which should exist cannot be decided from the available loss data.[46]

The decided lack of uniformity between the different sections of the country in the consideration given the type of construction, area, and height of a building is evidence of the confusion which exists regarding the extent to which these things affect the ability of a building to resist damage by wind. There seem to be no reasons connected either with the types of winds or the types of construction in the different sections of the country which warrant the present different treatment of these factors in the making of windstorm rates.[47]

3. *Coinsurance*

The coinsurance provisions required and used vary greatly between the different jurisdictions. In the East and the South all rates are based upon the use of a 50 per cent clause. In the Middle West and some states on the Pacific Coast,[48] rates are not based upon the use of any percentage clause. In all sections of the country, deductions from the rate are allowed for the use of various percentage clauses,[49] but there is little uniformity in the application of this principle.

The non-uniform coinsurance requirements seem to be due chiefly to the existence of anti-coinsurance laws in many states, especially those in the Middle West. Another but less important cause may be found in the conditions existing during the early years of the business.[50]

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[46] For criticism of the experience data kept by the companies see p. 161.

[47] It is questionable, however, if a change to secure uniformity in this respect should be made. The experience data which might be accumulated after the change could not be compared because of the differences in coinsurance requirements in the different sections of the country. Furthermore, the change would entail much trouble and expense.

[48] California, Nevada, Utah, Montana, and Washington. See p.149 .

[49] The credits do not apply where coinsurance is probhibited by state laws.

[50] See p. 65.

4. *Special Clauses*

Special clauses which may be endorsed on the policy include the hail damage and some form of a deductible clause. The hail clause used is the same in all parts of the country. A $50 deductible clause is permissible on farm property (not dwellings) in the East. In the South, Florida rates are based upon a $50 deductible clause (or $100 in seacoast territory) as mandatory unless the rate is increased 50 per cent. In all other southern states, a $25 limitation clause is required, or the rate is increased 20 per cent.

The reasons for the use of a deductible clause in windstorm insurance are similar to the reasons for the use of such a clause in other lines. Its use reduces the rate, not only because claims are less, but because the expense of settling small claims is eliminated. It is difficult, however, to convince the policyholders of the value of the deductible clause because of the dissatisfaction created at the settlement of claims. Most persons seem to prefer to pay higher windstorm rates and collect losses in full. The limitation clause is defective in that claims will be stretched, if possible, to exceed the limit in order that the loss may be collected. The limitation clause was used in Florida until the severe losses of 1926 and 1928 occurred. It was then necessary to adopt the high deductibles in order to prevent raising the rates to prohibitive figures.[51]

Rate Making Methods

Rates for insurance may be made in one of two ways, by the judgment method or through the use of statistics in some form. Judgment rates may result from individual or combined expression of opinions. Both kinds of judgment rates are in common use today. In marine insurance the rates are based entirely upon individual judgment. The combined judgment method is used to make rates for many forms of property insurance, including fire insurance.[52]

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[51] See p. 160 for the high loss ratio in Florida for recent years.

[52] Fire insurance rates are of two kinds, class or minimum rates similar to those described for windstorm insurance and schedule rates. Schedule rating is an attempt to measure physical differences of buildings from a key-rate. The key-rate is for a standard building in a standard city and it is made by the combined judgment method.

Statistical methods may take one of two forms, the pure premium method and the loss ratio method.[53] The pure premium method (used in making workmen's compensation and other liability rates) is not used for the computation of property damage rates because of the difficulties encountered in its application. The use of this method requires the careful collection and classification of much data showing losses and exposures for each kind of risk. As time goes on, the collection of proper data must be continued in order that modifying influences in the form of changing conditions may be reflected in the pure premium. The common practice of under-insurance, the small amount of experience data available, and the difficulties involved in the classification of risks prohibit the use of the pure premium method for making windstorm (and most kinds of property damage) insurance rates.

The difficulties encountered in computing property damage rates by the pure premium method have caused a resort to the loss ratio method. Here the losses paid for a given period are compared with premiums collected. The percentage result is then compared with the standard or what is looked upon as normal in the particular line of insurance. If the percentage is too high or too low when compared with the standard, an adjustment is made in rates for the next period. This method has the practical advantage of allowing revision of rates at necessary times without the careful collection and classification of past experience.

Rate Making Procedure in Windstorm Insurance

The rating structure as described in the first part of this chapter is largely a product of the evolution of the windstorm insurance business. At first the companies set up their own classes and charged whatever rates they pleased. With many small risks to deal with and with a resulting small premium from each, it was but natural that the companies would resort to the grouping of like risks in classes, charging a judgment rate

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[53] Kulp, C. A., *Casulaty Insurance*, Ronald Press Co., 1928, p. 390.

for each class. With the organization of underwriters associations throughout the country, the companies agreed upon a more elaborate classification and uniform rates for each class.[54] Minimum or class rates were necessary, however, because the cost of an inspection prohibited schedule rating of most windstorm risks.[55]

Today windstorm rates are made by the combined judgment method, with the loss ratio as a guide.[56] In the case of new classifications, the establishment of a rate is the result of judgment entirely. The committee or person delegated to establish the rate seeks advice from brokers and other persons prominent in the business. If the rate affects large risks (such as builder's risks) the purchaser of the insurance may be consulted. After considering such facts as are gathered in this manner and after comparing the new classification with the same or allied risks which are insured in other sections of the country, a rate is decided upon.

Existing rates (which are not necessarily justified)[57] are raised or lowered from time to time as the occasion warrants. Generally such changes are uniformly made throughout the classification list for one or more states when the loss ratio for several years shows that some revision is necessary.[58]

Rate Making Problems in Windstorm Insurance

A comparison of the premiums collected with losses paid each

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[54] As late as 1916, there were but two or three rates and no special classifications used in the East. See p. 66.

[55] Two classes of properties are rated by schedule in the East and three in the Middle West.

[56] After making an exmination of the Eastern Tornado Association in 1927, the examiner reported to the Insurance Department of N. Y. State: "The Association is not in possession of any statistical data as a basis for its rates. The rates originally fixed when the Association was organized in 1916 were apparently merely based upon judgment of underwriters and changes subsequently made appear to rest on the same basis." Copy of this report on file at the Insurance Department, Albany, N. Y.

[57] See p. 166.

[58] The Insurance Commissioner of North Carolina in 1929 demanded and obtained a reduction of about 20 per cent of inland and about 33 ⅓ per cent of the seacoast rates because the loss ratio had averaged about 15 per cent for several years. See *National Underwriter*, Oct. 5, 1929, p. 758.

year by all stock companies doing a windstorm business reveals that total premiums collected are more than sufficient to pay losses and expenses. Using premiums and losses previously given,[59] it is found that for the five-year period from 1925–1929, inclusive, total premiums equal $240,869,000 and total losses paid, $101,627,000. Assuming the cost of production (loading) to be forty per cent of total premiums, expenses of $96,347,000 plus losses of $101,627,000 when deducted from $240,869,000 leave a profit of $42,895,000. This is equal to 17.8 per cent of the total premiums. Similar computations for the same period for other leading lines, show less satisfactory results, except in the case of inland marine insurance. The profits of these lines expressed in percentages of premiums, are as follows: Fire, 10.9 per cent; motor vehicle, 14.7 per cent; ocean marine, a loss of 6.4 per cent; inland marine, 19.1 per cent.[60]

If a longer period than five years be taken for windstorm insurance, a more favorable result is obtained. Thus for a ten-year period,[61] the profit calculated in the same way equals approximately 19 per cent of premiums collected, while for a twenty-four-year period, 1906–1929, inclusive, the percentage is 20.6 per cent.[62]

An examination of windstorm premiums and losses for all stock companies by states for a five-year period 1924–1928, inclusive (see page 160) shows that in seven states the loss ratio exceeded 60 per cent for the period. In only four of these was

[59] See Table VII, p. 71.

[60] The following comparison of loss ratios is extracted from Table VII, p. 71.

	FIRE	MOTOR VEHICLE	OCEAN MARINE	INLAND MARINE	WIND-STORM
1925	55.1	47.4	66.0	51.3	35.8
1926	53.7	49.9	74.6	50.0	47.2
1927	45.2	47.4	75.1	47.5	65.9
1928	44.5	42.0	59.4	21.0	29.5
1929	46.0	42.2	59.2	41.3	34.2

[61] See Table VI, p. 69.

[62] The more favorable showing for the longer period is due to the severe losses which have been suffered during recent years. See Table IV, p. 46.

the volume of premiums comparatively large. The loss ratios in these states were: Florida, 455.4 per cent; Missouri, 125.6 per cent; South Carolina, 67.3 per cent; South Dakota, 93.3 per cent. In the twenty-one states which had more than $2,000,000 in premiums for the period, only three, Florida, Missouri, and South Dakota, had loss ratios exceeding 46 per cent. In most of the states, therefore, the experience was satisfactory.

The above statements warrant the conclusion that, from a general viewpoint, the companies should consider the windstorm insurance business to be satisfactory. While in some states, the losses have exceeded the premiums for a period, for the country as a whole there has been no general underestimation of risks which should cause a refusal to write the business. The companies as a group have collected more than enough premiums to pay losses and expenses.

The rate-making problems in the windstorm insurance business, therefore, are connected, not with how to make the business pay, but with how to determine a fair premium for each risk insured. Under the class system of rates used in windstorm insurance, even though enough premiums in total are collected, it is possible to have an unfair distribution of the costs of insurance. The excessive rates may balance (or more than balance) the deficient charges. In view of this it is pertinent at this point to inquire into the data which are available for rate-making purposes and following this to determine the value of these data in the rate-making process.

Loss Experience Available for Rate-Making Purposes

Figures showing total windstorm premiums collected and total losses paid for the entire country have been presented previously (page 69) for each of the years 1906–1929, inclusive. Similar data are available by states for the five-year period 1924–1928, inclusive. The following shows the premiums and losses for all states:[63]

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[63] From *Fire Insurance by States*, published by the Weekly Underwriter, 1930.

PREMIUMS AND LOSSES, 1924–1928, INCLUSIVE

STATE	PREMIUMS RECEIVED	LOSSES PAID	LOSS RATIO
Alabama	$2,554,284	$808,453	31.7
Arizona	44,429	19,147	43.1
Arkansas	4,223,019	1,663,064	39.4
California	117,425	32,247	27.5
Colorado	313,793	188,705	60.1
Connecticut	159,543	139,048	87.2
Delaware	127,964	62,587	48.9
District of Columbia	163,576	14,590	8.9
Florida	4,374,931	19,923,408	455.4
Georgia	1,303,240	212,716	16.3
Idaho	3,510	974	27.7
Illinois	25,364,791	11,410,764	45.0
Indiana	12,994,527	4,803,244	37.0
Iowa	9,694,515	2,873,807	29.6
Kansas	8,134,190	3,170,553	39.0
Kentucky	5,825,736	2,131,045	36.6
Louisiana	4,278,191	1,016,311	23.8
Maine	14,152	10,072	71.2
Maryland	544,961	225,118	41.3
Massachusetts	339,871	96,416	28.4
Michigan	3,996,848	399,999	10.0
Minnesota	7,460,701	3,401,302	45.6
Mississippi	3,164,139	825,594	26.1
Missouri	13,526,351	16,986,586	125.6
Montana	78,024	20,266	26.0
Nebraska	6,319,783	2,195,268	34.7
Nevada	1,631	530	32.5
New Hampshire	19,979	4,546	22.8
New Jersey	1,253,917	235,095	18.7
New Mexico	56,578	33,240	58.8
New York	1,513,299	864,004	57.1
North Carolina	880,963	129,971	14.8
North Dakota	3,773,243	1,296,203	34.4
Ohio	16,070,250	2,831,988	17.6
Oklahoma	9,145,664	4,144,531	45.3
Oregon	8,295	1,540	18.6
Pennsylvania	1,604,855	467,685	29.1
Rhode Island	35,906	16,301	29.2
South Carolina	782,361	526,143	67.3
South Dakota	4,869,389	4,543,702	93.3
Tennessee	3,133,921	1,105,690	35.3
Texas	13,387,201	3,674,250	27.4
Utah	3,491	4,938	141.4
Vermont	8,551	2,703	31.6
Virginia	283,230	53,493	18.9
Washington	30,743	5,523	18.0
West Virginia	262,234	27,293	10.4
Wisconsin	9,399,596	2,442,828	26.0
Wyoming	42,637	17,250	40.5
Totals	$181,710,428	$95,060,731	52.3

Experience data by classes of risks are being collected for Eastern and Southern territory, but this practice is not followed elsewhere.[64] Since 1925 the Eastern Tornado Association has been collecting and reporting the windstorm experience of its members to the Insurance Department of New York.[65] The experience is reported according to a "classified schedule" containing approximately thirty-eight classes. The experience is reported by these classes for New York State separately and for the rest of the Association territory as a whole. Table X shows this experience for a five-year period, 1924–1928, inclusive. The Southern Tornado Association maintains records of the experience of its members, the experience being divided into fifty classes. Table IX shows this experience for the first twenty-five classes as collected for the six years, 1923–1928, inclusive. Total premiums and losses for all fifty classes are given at the bottom of the table.

Value of Available Experience Data

Past underwriting experience, properly classified, is the proper basis for the determination of any insurance rate. The extent at present to which windstorm rates can be based upon experience is limited by the shortcomings of the data collected thus far. These shortcomings are connected chiefly with the comparatively small volume of experience and the large number of classes used, although others will be mentioned shortly. The volume of premium income in the East is too small to be divided over the thirty-eight classes used in the Eastern territory. While premium income is greater for the South, the fifty classes adopted for

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[64] By elsewhere is meant other sections of the country and also by organizations. In the Middle West the companies commonly keep experience figures for the state as a whole on all classes of property. This is for their own information and for the reports made to State Insurance Departments. The National Board of Fire Underwriters although active in the collection fire loss experience has never attempted the collection of windstorm loss statistics of any kind.

[65] The report is made in order to comply with section 141–a, paragraph 5 of the N. Y. Insurance Law. Experience is reported by classes for New York State and for the rest of the Eastern territory.

TABLE IX

SOUTHERN TORNADO ASSOCIATION EXPERIENCE, SIX YEARS, 1923–28, INCLUSIVE*

CLASSES	INLAND DISTRICT			COAST DISTRICT			COMBINED		
	PREM.	LOSS	RATIO PERCENT	PREM.	LOSS	RATIO PERCENT	PREM.	LOSS	RATIO PERCENT
Bridges—Open Work Skeleton Steel and Iron	6	20	292	17	14	84	24	34	143
Bridges—Open Work Skeleton Frame	4	†	12	4	3	80	8	3	47
Bridges—Closed Frame (Old Style)	2	†	1	3	7	202	5	7	128
Buildings in Process—Brick	98	34	35	59	92	156	158	127	80
Buildings in Process—Frame	123	27	22	62	86	138	186	114	61
Buildings in Process—Superior Construction	47	6	14	50	151	298	98	158	161
Buildings—Large Open Area—not classed	126	39	31	120	139	115	247	178	72
Buildings—Of Superior Construction with steel or Iron Frame and Brick, Stone or Concrete walls or of reinforced Concrete Construction throughout, also contents not specifically rated	243	35	14	271	2,006	739	514	2,041	397
Churches with steeples	123	60	49	59	27	48	183	88	48
Churches without steeples	244	69	29	89	120	134	333	190	57
Coal Tipples	38	4	13	3	1	43	41	6	15

TABLE IX (Continued)

Cotton Gins—Frame	259	53	21	26	1	5	286	55	19
Cotton Gins—Brick	11	6	51	7	†	5	19	6	34
Cotton Mills and Warehouses in connection	213	123	58	39	20	53	253	144	57
Cotton Seed Oil Plants and Peanut Oil Mills—Building and Machinery	148	32	22	28	3	11	176	35	20
Seed and Hull houses of same	13	5	40	3	†	19	17	6	36
Cotton Seed Oil, Molasses and Steel Grain Tanks and Contents	18	3	17	10	†	7	29	3	14
Cotton Compress and Shed; also Cotton Warehouses	89	40	45	63	16	26	153	56	37
Court House, Schools and Colleges	670	150	22	189	303	160	859	453	53
Dwellings and Barns	6,862	2,448	36	4,338	9,834	227	11,200	12,282	110
Fair Grounds and Park Buildings—Frame and Ironclad	67	60	90	34	72	207	102	133	103
Farm or Country Property—Dwellings, Barns and Outbuildings	2,462	1,080	44	169	120	71	2,632	1,200	46
Fertilizer and Phosphate Plants including Phosphate Mining Plants	133	30	23	92	38	42	225	68	31
Flour Mills-Frame	50	45	92	7	5	72	57	51	88
Flour Mills-Brick	10	3	30	6	†	9	16	3	22
Totals (for fifty classes)	16,764	5,648	34	8,656	18,387	212	25,420	24,035	95

*Premiums and Losses in thousands of dollars, i.e., 000 omitted. Premiums include gross direct less return only and exclude reinsurance ceded and assumed. Losses include gross direct paid losses less salvage, plus adjusting expense; and excludes paid losses and expenses on reinsurance ceded and assumed.

† Indicate losses less than $1,000.

TABLE X

Eastern Tornado Association
Experience, Five Years, 1924–1928, Inclusive

	NET PREMIUM WRITTEN	NET LOSSES PAID	LOSS RATIO PERCENT
Bridges—open work skeleton steel and iron	$33,269	$6,575	19.76
Bridges—open work skeleton frame	11,086	18	.16
Bridges—closed frame (old style)	5,205	4,436	85.22
Buildings in Process—Brick	32,060	2,319	7.22
Building in Process—Frame	18,228	4,437	24.34
Buildings in Process—Superior Construction	32,879	1,548	4.70
Buildings—large open areas not otherwise classed	97,290	31,561	32.44
Buildings—Superior Construction, etc.	129,624	21,093	16.27
Churches with Steeples	46,071	23,733	51.51
Churches without Steeples	45,688	15,822	34.63
Coal Tipples, Coal, Ore and Dock Hoisting Apparatus, etc	134,297	17,915	13.33
Cotton Mills and Warehouses in connection	6,773	7,016	103.58
Court Houses, Schools and Colleges	66,413	21,641	32.58
Dwellings and Barns	2,524,182	659,736	26.13
Fair Grounds and Park Buildings—frame and ironclad	43,542	18,105	41.58
Farm or Country Property—Dwellings, Barns, Outbuildings, etc	664,526	528,011	79.45
Fertilizer Plants, Salt Blocks, Ice Houses	19,074	6,733	35.29
Flour Mills, Frame	16,724	8,728	52.18
Flour Mills, Brick	6,182	1,481	23.95
Gas Holders, iron	13,873	154	1.11
Grain Elevators—Frame and Ironclad—Building and Contents	19,810	1,721	8.79
Grain Elevators—Reinforced Concrete—Building and Contents	82,085	2,144	2.61
Marine Legs of Grain Elevators	8,730	817	9.35
Green Houses—Hot Houses	38,748	8,281	21.31
Hail Damage	38,688	32,794	84.76
Hides-in vats at tanneries	9,583	714	7.45
Lumber Yards	23,950	30,219	126.17
Manufacturing Plants not otherwise classed and less than 10,000 sq. ft.	407,605	190,645	46.77
Mercantile Buildings and Hotels	304,713	62,125	20.38
Mercantile Stocks in brick, frame or ironclad Buildings	66,196	25,631	38.72
Mercantile Stocks in buildings of superior Construction	7,684	678	8.82
Resort Hotels, large	15,154	6,519	43.01
Saw Mills, Planing, Stave and Shingle Mills, ord. Dry Kilns	5,805	2,815	48.49
Smoke Stacks—iron	7,167	5,928	82.82
Smoke Stacks—bricks	2,813	4,538	161.32
Terminal and Wharf Sheds	15,046	7,583	50.39
Water Tanks and Wind Mills	16,629	1,021	6.13
Woodworkers—except saw mills, etc.	11,342	9,551	84.20
Miscellaneous	32,720	13,361	40.83
Total	5,061,454	1,788,147	35.32

Southern territory seem entirely too many.[66] An additional hindrance in using the data is the fact that the statistics for Eastern territory are not collected by classes corresponding to those used in the rate manual. The number of classes in the manual for which rates have been promulgated, greatly exceed those for which experience is compiled.[67] In this connection there has been a distinct tendency during the last ten years in the Middle West to reduce the classes of windstorm risks. The tendency in the East seems to be the opposite. There are more classes within this territory than any other, yet the premium income is much smaller. When it is considered that the National Board of Fire Underwriters in 1928 reduced the classes of risks for which it gathers fire loss data from 164 to 28, it would appear that the number of classes in windstorm insurance should be appreciably less than that in use today.[68] Another reason presents itself as to why the data cannot be used except as a guide. A period of six years is too short to allow the law of average to work in windstorm insurance. Destructive winds causing serious damage may not visit an area as large as a state for a period of years. When such storms do occur, they are often of a sweeping character, causing losses similar to conflagration losses in fire insurance.[69]

An examination of the loss data by classes presented in Tables

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[66] It was stated on p. 151, that net premiums written during recent years by members of these two associations average over $1,000,000 per year in Eastern territory and approximately $7,000,000 per year for Southern territory. Some small companies that operate in these territories do not belong to the associations. The bulk of the premiums, however, are collected by association members.

[67] There are well over 100 rates in the manual. See p. 140.

[68] See the foreword in *Standard Fire Classification*, published by the National Board of Fire Underwriters for 1928 and compare with the last previous classification issued October 30, 1924.

[69] There is some difference of opinion about the length of time necessary for the accumulation of insurance data regarding destructive winds. Some authorities say that data for a period of 30 years are necessary if the law of average is to work at any particular location. Others feel that a twenty-year period is long enough. In this connection, if data are gathered forsuch a long period, changing conditions might make it worthless. This would have been true in Florida from 1920 to 1926 when properties were rapidly built and the new construction, due to the boom, was of a much poorer type than that which existed formerly. In the other direction, progress in prevention, the adoption of building ordinances, and increased efficiency in construction may take away much of the value of the data.

IX and X, confirms the weaknesses pointed out. The premiums and losses for many classes are too small to be of value in making rates. For example, in Table IX, total premiums for the first item, bridges (open work, skeleton steel and iron), amount to but $24,305 for the six-year period. The loss ratio on this item is 143 per cent. Yet the loss ratio for frame bridges, which are recognized as being far more susceptible to wind damage, was only 47 per cent for the period. Even if the data given above were sufficiently large for rate-making purposes, another problem would confront the maker of windstorm rates.

Due to our present system of regulating the insurance business by state laws, the rate structure often varies with state boundaries.[70] Experience data, therefore, should be kept by classes for each state, and this is not done at the present time.[71]

Suggested Changes in Rate-Making Methods[72]

The inherent difficulties connected with the making of windstorm rates have brought forth a number of suggestions regarding changes in method and the actual establishment of an independent rating bureau for this purpose.[73] Most of the suggestions come from those in the business. Naturally, these involve a modification of the present methods rather than the substitution of a new procedure. An example is the $100 deductible clause which was adopted in Florida in 1929. Recently, suggestions have been made that the principle of schedule rating be applied to windstorm risks in order that consideration might be given to such things as storm shutters, wireglass, and metal frames which tend to reduce the loss.[74] In some areas such as

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[70] See p. 74.

[71] It would be possible to keep separate records for each state and possibly overcome deficiencies in data for some classes by computing the premium in a manner similar to that used in Workmen's Compensation insurance. Such procedure, however, is not practical in windstorm insurance because the expense compared with the amount of business done would be prohibitive. Furthermore, the difficulties of proper classification would have to be solved first. See p. 156.

[72] The word method here means the manner of making rates in actual practice as distinguished from the theoretical methods discussed on p. 155.

[73] See footnote (42) p. 152.

[74] See the *Weekly Underwriter*, November 2, 1929, p. 985 and February 1, 1930, p. 275.

Florida, where the hazard is very important, it might be practical to adopt this method of rating for certain risks. In most parts of the country, however, the expense involved in schedule rating would be so great as to prohibit its use.[75]

An unusual suggestion concerning windstorm rates has been made by a prominent writer on the subject. Mr. Frederick L. Hoffman states:[76]

> "I question if the present procedure of premium charges is compatible with the best interests of the future of windstorm insurance. In other words, I feel that it would be much better to average all losses throughout the country and compute a single premium for the whole instead of attempting to compute separate premium charges for particular areas assumed on fragmentary data to be especially liable to windstorm damage. What progress would life insurance have made if premiums had been computed on a strict basis of mortality experience for every state or section of this country? Some sections unquestionably have a higher death rate than others but the losses are averaged to the advantage of all concerned. Of course, exceptions may be advisable, just as in life insurance certain small portions of the country are avoided by certain companies, although I question the advisability of even this procedure at the present time."

The foregoing opinion seems to be based upon the assumption that under the present system of rates the future of windstorm insurance is in doubt and that somehow a nation-wide rate would be better than the existing rate structure. While there are, as has been pointed out, many problems connected with rates, the steady and rapid growth of the business in spite of these problems shows that the above assumption regarding the future is not warranted.

The suggested nation-wide rate plan has a number of defects. It follows the often expressed idea that the purpose of insurance is the assumption of the risks of many and the payment of the losses incurred by a few; but it loses sight of the point that the protection extended should be paid for in proportion to the risk

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[75] Two classes of risks are now rated by schedule in the East and three in the Middle West.

[76] Hoffman, Frederick L., *Windstorm and Tornado Insurance*, Spectator Company, 1926, p. 4.

involved. Each insured should contribute to the common fund according to the protection received. If this is not done, rates are inequitable. It is granted that insurance with inequitable rates is better than no insurance at all, and if it becomes necessary to choose between these two alternatives with respect to windstorm insurance, then the use of a nation-wide rate will be justified. As stated above, however, such a choice is not necessary.

Should the plan be adopted, a serious difficulty would be encountered. A flat rate for the country would discriminate against insured persons with property located in the less hazardous sections and would favor the insured persons in the more hazardous territories, especially those with poor types of risks. As a consequence, there would be a tendency for the former to do without insurance and the latter to take out insurance. This adverse selection (if it can be called that) would work to the detriment of the companies and would cause before long, a revision in rates.

The life insurance analogy is not a good one. The two are not comparable. Life insurance risks must pass a medical examination before they are accepted. Even under a non-medical plan it is not likely that the hazard in life insurance would vary as much as it does in windstorm insurance.

Conclusions Regarding Windstorm Rates

Past underwriting experience, properly classified, is the correct basis for the determination of any insurance rate. Judgment rates are justified only when conditions prevent the gathering and the use of experience data. It may be that the line is new and proper time has not elapsed for the accumulation of the necessary experience. Where the line is old, a small volume of business or a multiplicity of factors which must be considered will prevent the proper classification of the data for its use in the rate-making process.

The above mentioned difficulties are encountered in the making of rates for most property damage lines and windstorm insurance is no exception to the rule. Evidence of this is plentiful through-

out the preceding pages. No data of value have been collected for Middle Western territory and data collected for the East and South contain many defects when an attempt is made to use it for rate making purposes.

In spite of the difficulties to be overcome, steps should be taken at once toward the accumulation of experience data for each of the various states. These data should be collected for classes of property and the number of classes should be much smaller than that which now exists in the East and South. The number of classes used in the Middle West seems to be satisfactory.[77] At the end of a five-year period, the collected data in this form (by classes and states) should permit tentative rates to be made by the loss ratio method[78] in twenty or more important windstorm states. During the five-year period, 1924–1928, premium income in each of twenty-one states exceeded $2,000,000.[79] In the other states rates could be continued under the present system until sufficient data becomes available for rate-making purposes. In a number of the less hazardous states where data would accumulate slowly the present rating system will, no doubt, have to be continued for twenty or more years.[80]

The collection of data in this manner would offer several advantages. Rates made on the basis of state experience would be more equitable than existing rates because they would more nearly represent the frequency and the severity of the hazard at the particular location.[81] The rates could be revised at frequent intervals without great expense. All that would be necessary would be a revision upward or downward of the rates of the classes for which the loss ratio varied from the normal. Probably the most important benefit would accrue to the companies. They would have a statistical justification for rates and would thus be able to defend their position when they desired

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[77] This number varies between states, ranging from 8 to 11, excluding risks rated by schedule. See p. 143.

[78] See p. 156.

[79] See p. 160.

[80] See p. 165.

[81] The other important rate factors would be considered under the plan. Different types of buildings would be assigned to different classes and take different rates. Coinsurance requirements and special clauses endorsed on the policy would be considered as they are under existing rules.

a change in rates or when they desired to oppose an order by the Insurance Commissioner for such a change. The disadvantages are concerned chiefly with the expense connected with the necessary changes and the fact that within state boundary lines the hazard may vary to some extent. The state has been selected as a matter of expediency. The plan involves the least amount of change from existing practices. Eventually, it would be possible to collect data and vary rates within those states wherein the hazard proved sufficiently different between parts of the state to warrant such consideration.

In conclusion, it is obvious that under any method of making windstorm rates, underwriting judgment must continue for a number of years to play a prominent part in the rate-making process.

VI

Problems and Conclusions

At the beginning of this thesis it was stated that the purpose was to survey the underwriting experience of the windstorm insurance business, to analyze its development, and to present its problems and their solution whenever possible. The preceding chapters contain this survey and analysis of the field. At the end of the three chapters on policy forms and their analysis, prevention of windstorm loss, and rates and rate factors, conclusions have been presented regarding each of these subjects.[1] It remains, therefore, to consider the study as a whole and to draw conclusions regarding the present and the future of the windstorm insurance business.

Progress and Present Status

Windstorm insurance, after more than half a century of development, is today one of the most important of the property damage coverages. The protection is sold by the stock fire insurance companies, the associated factory mutual insurance companies, and the mutual windstorm insurance companies,[2] with the stock fire insurance companies predominating in the business. The volume of windstorm premiums collected by stock companies is exceeded only by premiums collected in the fire, motor vehicle, and marine insurance lines.[3] The windstorm insurance business has assumed this importance during recent years, the volume of premiums collected by the stock companies during 1930 being more than double that of ten years previous.

The stock fire insurance companies have succeeded in placing the windstorm insurance business upon a comparatively satisfactory underwriting basis. The progress achieved has come

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[1] The subjects in the other chapters are treated in such a manner that conclusions are not required at the end.

[2] Two kinds of mutual companies are included under this term, the farmers' mutual and the windstorm mutual. See p. 70.

[3] See Table VII, p. 71.

about mainly through the cooperation of the companies prominent in the business. Through the medium of underwriters associations, a standard policy and uniform rates, rules, and forms have been adopted for each of the large sections of the country. The meaning of the provisions of the policies has been largely determined by the courts. The underwriters associations in the East and South have attempted the collection of loss experience by classes in order to obtain a statistical guide for the making of equitable windstorm rates.

Windstorm Insurance Problems

In spite of the achievements made in underwriting windstorm losses, the business faces numerous problems.[4] Most of these have been considered in their proper places in the previous pages. Their enumeration at this point will serve as a summary and at the same time enable some conclusions to be drawn which could not be advanced when the problems were considered separately.[5] In presenting these problems it is not intended to over-emphasize the difficulties of the business nor to minimize the importance of the progress made. The facts should be faced and anything which contributes to their solution will confer benefits upon all parties concerned.

1. *Adjustment of Losses*

The problems encountered in loss adjustments fall naturally into two groups, those due to catastrophes and others which are

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[4] Since the stock fire insurance companies do by far the greater portion of the business, the remainder of this chapter is written with this in mind. In most cases, however, the statements apply to the business regardless of the type of company.

[5] There are numerous problems of lesser importance than those mentioned in this chapter. Some are local in nature. For example, in the Southeastern states where hurricanes can be predicted for hours in advance, the companies have had difficulty in making and enforcing uniform rules pertaining to the sale of windstorm insurance after it is known that a storm is approaching. Another problem in this area is the large loss ratios on many classes of property. Some companies will not write a windstorm risk unless it gets the fire business also. Others will not accept windstorm risks if the insurance is less than $1500 in amount. In the Middle West the windstorm mutuals face problems of their own which are intimately connected with their methods of doing business. Finally, the different types of companies face the problems arising from competition with each other for the windstorm business.

largely individual. The numerous claims arising after severe storms are settled by the same cooperative methods used by the companies in handling fire loss claims due to conflagrations. Adjustment difficulties which arise in the settlement of individual losses are usually connected in some way with the exceptions mentioned in the policy. These will be considered later.[6] The moral hazard in windstorm insurance is negligible. After a loss, it is possible, as in other forms of insurance, to make excessive and fraudulent claims.

2. *Sales Resistance*

Since the origin of the business the companies have experienced a heavy demand for the insurance in some areas and a general unwillingness to purchase the protection in others. In the more hazardous areas it has been difficult to make the business pay,[7] and in one section, the hazard is so great that at times the underwriting capacity is not equal to the demand.[8] In order to keep the rates from being prohibitive in the hazardous areas, and probably because of inadequate knowledge concerning the hazard over any period of years, the companies have hedged themselves by charging uniform rates over large territories. Such a plan, however, does not favor the sale of the coverage where the probability of serious damage is relatively small. Consequently, in the less hazardous sections, the insurance can be sold only after a severe storm. At this time the need is aparent and people buy without a sales argument. Subsequently, it may be a year or more before another storm occurs. During the interval people not only will not buy the protection, but existing policies are allowed to lapse.

The companies have tried to remedy this situation by selling windstorm insurance with the fire coverage. This puts the emphasis upon the education of the policyholder and it is to be commended only if the charge for the insurance is fair. To complete the remedy the companies should follow the sugges-

[6] See p. 174.
[7] See p. 160.
[8] This has been true in Florida after some of the severe storms which have occurred there. See p. 69.

tion previously made[9] with respect to rates, i. e., collect data by states for a small number of classes, with the purpose of charging for the protection according to the frequency and severity of the hazard.

3. *Rates*

The problems connected with rates and their solution have been considered in the chapter devoted to the subject. The one criticism that can be made with respect to rates is the failure of the companies to collect experience data in the past. Losses arising from destructive winds are important in the majority of the states[10] and the business has been in existence for a considerable length of time.[11] Yet rates are still largely on a judgment basis and no data are available to show their adequacy. Fortunately, the rates charged in the past have been sufficiently large, on the average, to permit the companies to make a profit.

4. *The Extent of the Coverage*

Since the formation of the first policy, the companies have faced a problem concerning the extent of the protection to be offered. Should the policy cover all storm damage or should it be restricted to windstorm damage only? Protection against the latter is no doubt much too narrow and does not properly serve the insured. To cover all storm damage would place a tremendous liability upon the insurer.[12] The present policy is a compromise between the two extremes with recent events indicating a tendency to broaden the coverage. Water damage is covered if the water enters an opening in the building made by the wind.[13] Hail coverage is provided by the attachment of a hail damage clause upon the payment of an extra premium.[14] This clause was added some years ago because of the difficulties encountered in adjusting windstorm losses. When hail damage

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[9] See p. 169.
[10] See Table IV, p. 46.
[11] See p. 54.
[12] See p. 55 for an explanation of the liability of the insurer under a policy insuring against loss by storm.
[13] See p. 95.
[14] See p. 101.

occurred during a windstorm, it was often impossible to separate the damage due to wind and that due to hail. Even where it could be separated the insured was frequently dissatisfied because he had expected to recover such losses under his policy. Similar adjustment difficulties confront the companies now when they attempt to isolate flood damage which occurs during many windstorms. Much dissatisfaction exists with respect to this point, but a solution of the problem does not seem near. In view of the restricted localities over which flood damage may be expected to occur it is doubtful if the companies can safely assume this risk at a premium which the insured will pay.

5. *Plate Glass*

That part of the policy referring to plate glass is still unsatisfactory. In the Middle West and the South protection on plate glass is limited to the same proportion of the insurance carried as the value of all plate glass bears to the total value of the building. Since it is not necessary, nor is it usual, to carry windstorm insurance to the full extent of values, it is possible for the policyholder to suffer a loss on plate glass and not be able to recover in full. Insuring the glass with a casualty company will not remedy the situation entirely unless the insured buys sufficient protection. Such policies contribute on a pro-rata basis with the windstorm coverage. The Eastern windstorm policy includes a provision which has partly solved the difficulty. It provides that if other insurance on plate glass exists in a casualty company, the windstorm insurance does not contribute in any manner to the loss. Under this plan, however, if the insured has a casualty policy, he is paying for protection under his windstorm policy which he does not receive since the premium is the same in both cases. A better method of handling the situation would seem to be to exclude the protection entirely from the windstorm policy and attach a plate glass damage clause thereto when no casualty policy is carried. This would necessitate an extra premium charge and the adoption of a clause to be endorsed on the policy.[15]

[15] The cost of the plate glass protection as now extended under the windstorm policy is slight. Some contend that because of the low charge and because many persons would not carry a casualty policy on their plate glass it is better to continue the use of present policy provisions.

Regarding the Solution of Windstorm Insurance Problems

An examination of the foregoing problems shows that the solution of all but one[16] would be facilitated if the underwriter possessed an adequate knowledge of the windstorm hazard. The two most important groups of problems, those relating to rates and to the policy coverage, depend mainly upon this information for their solution. The protection will not be satisfactory to the insured unless it is clearly defined in the policy contract and a correct definition cannot be formed if the underwriter does not understand the hazard. This knowledge of the hazard is of equal importance to the rate-maker. Rates to be fair should be proportioned according to the risk assumed. Success in the windstorm insurance business depends more upon a knowledge of the frequency and intensity of destructive winds than upon anything else. This point has been stated before but it cannot be over-emphasized. Scientific underwriting of the windstorm hazard depends upon it. It is for this reason that much emphasis has been placed upon the subject in this study. The explanation of the hazard contained in Chapter I should supply much of the knowledge that is needed. However, the loss data presented in this chapter will not provide the rate-maker with a statistical basis for rates. Insurance rates must reflect the hazard assumed by the companies and this may be entirely different from that represented by general loss statistics. Nevertheless, the loss data shown should be of service in a supplementary way. For example, it could be used as an indication of the severity of the hazard in each of the various states.

Windstorm Insurance and Other Lines

Windstorm insurance problems will be more easily solved if both insurer and insured are able to distinguish between the different insurance coverages and to realize that the problems in any one line are not necessarily the same as those in other lines. A proper perspective will permit the emphasis to be placed upon the vital problems of the business.

Windstorm insurance falls within that group of coverages

[16] The problem relating to plate glass coverage.

known as weather forms of insurance.[17] In this group, besides windstorm insurance will be found the hail, frost and freeze, crop and rain lines. The lightning hazard should also be included although it is not a separate line. In all of these types of insurance the loss insured against arises from some form of atmospheric disturbance. To understand the frequency and the intensity of the hazard, therefore, it is necessary to have a knowledge of the science of meteorology. Floods are due indirectly to atmospheric disturbances and in this sense, flood insurance belongs in this group.

It is a mistake to think of the above group of coverages or to attempt a solution of their problems from the standpoint of experience gained in dissimilar lines. More progress can be achieved by building up an underwriting experience peculiar to weather forms of insurance. Experience gained with fire underwriting, which exceeds that of any other line, is of value to the windstorm underwriter only with respect to the application of general insurance principles such as those of indemnity and insurable interest.

Only in recent years have the weather forms of insurance received more than passing attention. This has been due partly to the difficulty of estimating with any degree of exactness the probablility of occurrence of the particular atmospheric phenomena causing the loss. These types of insurance deserve more attention than they have received. Windstorm insurance is older than the others and far more important from the standpoint of volume of premiums. The business is also the most stable of the group although from year to year and between companies, extremely wide variations in premiums and losses occur. It is hoped that this study will contribute, not only to the advancement of the windstorm insurance business but to the progress which is being made in the other forms of weather insurance.

The Future of Windstorm Insurance

While it is difficult to accurately foretell the future, it seems

[17] Hoffman, G. Wright, *Weather Forms of Insurance*, The Annals of the American Academy of Political and Social Science, Philadelphia, Pa., March, 1927, p. 121.

obvious that any conclusions with respect to the future of windstorm insurance should be of an optimistic nature. The hazard is one which cannot be controlled and, therefore, it will, as far as is known, be with us always. The growth of property values in the country should provide additional demand for windstorm insurance as time goes on. Proper education of existing property owners toward a realization of the risk of loss should further supplement the demand for the coverage. At the present time there is a discernable movement on the part of banks, building and loan associations, and other lending institutions to require windstorm insurance as well as fire insurance on improved real estate placed by mortgagors as security for loans.[18] Prevention may materially reduce the loss, but the elimination of all loss by this means will not be practical for many years to come. If the companies proceed along present underwriting lines, and endeavor to profit by experience, there seems to be no reason why steady progress should not be made.

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[18] Most states do not have laws compelling banks and building and loan associations to obtain such security. In Rhode Island, saving funds invested in mortgages and in Wisconsin, Building and loan funds must be protected by windstorm insurance.

Letters addressed to state banking officials (41 replies) show that at present in the following states windstorm insurance is practically required because of "recommendations" of the State banking department: Kansas (banks and building and loan associations); Illinois (banks and building and loan associations); Minnesota (banks and building and loan associations); Mississippi, banks.

In the following states, while no pressure is brought to bear upon the lending institutions, it is common to require the protection: Oklahoma, Texas, South Dakota, Ohio, Alabama, Nebraska, Louisiana, Idaho, and Michigan. While the replies did not so indicate, it is believed that windstorm insurance is commonly required in the states of Indiana, Missouri, New Jersey, North Dakota, Iowa, and Pennsylvania.

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Missouri Inspection Bureau, St. Louis.
Nebraska Inspection Bureau, Omaha.
North Carolina Inspection and Rating Bureau, Raleigh.
North Dakota—General Inspection Bureau, Fargo.
Ohio Inspection Bureau, Columbus.
Oklahoma Inspection Bureau, Oklahoma City.
Oregon Insurance Rating Bureau, Portland.
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APPENDIX "A"

The General Wind Circulation of the Earth[1]

Definitions

To distinguish between the solid earth, the oceans, and the air, meteorologists often use the words geosphere, hydrosphere, and atmosphere, respectively. The atmosphere is a thin layer of gas which surrounds the earth.[2] Commonly called air, this gas has a greater density at lower altitudes than at higher altitudes. Because of this, one-half of the atmosphere is within three and a half miles of the earth.[3] Observations reveal air at a height of nearly 200 miles, but not of a density or composition like that found near the earth.[4]

The movement of air from place to place on the earth's surface produces wind.[5]

The Cause of Wind

To understand the cause of wind, or why the atmosphere moves, it is necessary to understand the nature of air. Air, having mass, is acted upon by the force of gravity. Gravity gives it weight, the amount varying according to the height of the column of air above the spot in question. The higher the elevation, the less the pressure of the air at a given point because of the smaller amount of air above that point.

Like any other gas, air is affected by the application of heat or cold. Heat expands, and cold contracts the air. Expansion and contraction, moreover, affect the pressure of air. The colder the air, the greater the density, and hence the greater the pressure exerted upon objects beneath. Likewise, the warmer the air, the less the density, and hence the less pressure upon objects beneath.

These brief explanations concerning some properties of air lead to a statement of the convection theory of the movement of air. Convection is the primary cause of all air motion.[6] Through convection the air is distributed from places of higher temperature to places of lower temperature. The reason for the movement of any stream of air is the difference in the atmospheric pressure

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[1] If the reader desires to pursue the subject further than that outlined in the following pages, he should refer to a standard text, several of which are quoted in this appendix and in the first chapter.

[2] Milham, W. I., *Meteorology*, MacMillan Co., N. Y., 1927, p. 6.

[3] Ibid., p. 20.

[4] Moore, W. L. *Descriptive Meteorology*, D. Appleton & Co., N. Y., 1910, p. 8.

[5] Technically, only air movements which are horizontal to and near the earth's surface should be called wind. All other movements are air currents. Milham, *op. cit.*, p. 136. See also Moore, *op. cit.*, p. 279.

[6] For a detailed explanation of the nature and properties of air see Milham, *op. cit.*, p. 6, or any standard text on Meteorology.

between two places. Pressure of the air becomes less as it is heated. This lighter air tends to rise, being forced aloft by the surrounding colder air which comes in from adjoining regions of higher pressure. Motion of the air, therefore, is due to the force of gravity. This force is acting constantly through convection to equalize the air pressure by the circulation of the air. By the same process, heat, which causes the differences in pressure, is being transferred and equalized throughout the atmosphere.

General Wind Circulation on the Earth

The principle of convection serves to explain what is known as the general wind circulation of the earth. The sun applies about three times as much heat at the equator as it does at the poles.[7] If the earth did not rotate, the heat thus applied at the equator[8] would cause a constant interchange of air between the equatorial regions and the poles. This interchange of air would take place along the lines of the meridians. The air at the equator, heated by the sun, would rise and flow toward the colder regions of the poles; these currents cooling over the polar regions, would descend and return along the surface toward the equator. Upon reaching the warmer belt of the equator, the returning air would be heated again by the sun and the process repeated. On a stationary earth, therefore, wind movements would be caused by an unequal pressure distribution between the poles and the equator, produced in turn by the unequal heating of the earth's surface.[9]

The earth's rotation, however, must be considered. In its passage around the sun, the earth rotates from west to east with a speed of about 17 miles per minute at the equator.[10] The effect of this rotation is to alter materially the wind circulation as just described for a non-rotating earth. Instead of the currents flowing north and south, the rotation of the earth causes a deviation to the right of a straight line in the Northern Hemisphere (to the left in the the Southern Hemisphere), with the tendency of the deviating air currents to move in a circle. This deflective influence due to the earth's rotation applies to air (and everything else as well) moving in any direction.[11] The principle just

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[7] Milham, *op. cit.*, p. 157.

[8] The heat is applied primarily at the bottom of the atmosphere. *Ibid.*, p. 156.

[9] Whatham, Richard, *Meteorology for Aviator and Layman*, Frederick A. Stokes Co., N. Y., 1930, Chater 2.

[10] Chandler, Hatchett, *The Origin and Nature of a Hurricane*, privately published in Dallas, Texas, 1922, p. 14.

[11] The theory of the effect of the earth's rotation on moving bodies on the earth's surface has been worked out by mathematicians. Farrell, in his book *A Popular Treatise on the Winds*, 1856, was the first to work the idea out. His work caused a revolution in Meteorology. *Cf.* Milham, *op. cit.*, p. 161.

stated is so important that meteorologists recognize and quote it as a law. It will serve later[12] to help explain the movement of those storms in the Northern Hemisphere[13] which affect the United States. At this point it serves to explain an important factor in the general circulation of the atmosphere, viz., the existence of belts of high pressure which extend around the earth in each hemisphere.

High Pressure Belts

High pressure belts of calm exist in each hemisphere at about 30–35 degrees from the equator. Their existence is due to the deflective influence of the earth's rotation. The warm air, rising at the equator, starts its poleward journey. The rotation of the earth causes a deviation to the right in the Northern Hemisphere[14] and the current becomes a westerly wind.[15] When it reaches the North Pole, the velocity of this westerly current is so great that it encircles the Pole in a great whirl.[16] Centrifugal force of this whirling current creates an area of low pressure at the pole and tends to push back or pile up the air over a belt further south. This belt and a similar belt in the Southern Hemisphere are called the *horse latitudes*.[17] These belts determine to a large extent the flow of certain winds on the surface of the earth.

Surface Winds of the Earth

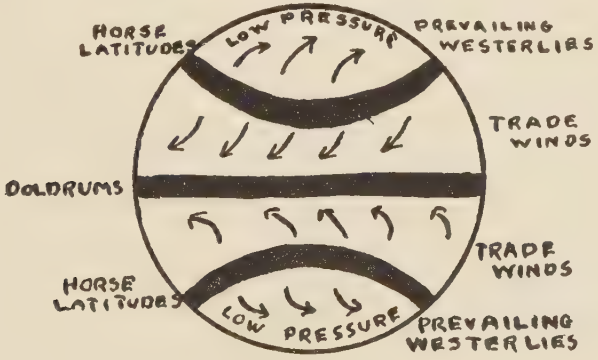

FIGURE NO. 1

[12] See p. 17.
[13] This principle also explains the occurrence of storms in the Southern Hemisphere. Storms occurring in the Southern Hemisphere, however, are not important from the standpoing of the United States.
[14] To the left in the Southern Hemisphere.
[15] Moore, *op. cit.*, p. 139.
[16] Milham, W. I., *op. cit.*, p. 162.
[17] *Ibid.*, p. 168.

Figure No. 1 shows the general wind system of the earth up to 3,000 feet in height. It is a picture of those winds which would occur on the earth's surface if no other factors except rotation and heating at the equator were considered. Other factors, to be mentioned shortly modify this distribution somewhat, but in the main it holds true.[18]

1. *Prevailing Westerly Winds.*

The prevailing westerlies and their cause have been referred to previously.[19] In the Northern Hemisphere these winds blow from the tropical belt of high pressure toward the northeast. In the Southern Hemisphere they blow from the tropical belt of high pressure toward the southeast. The rotation of the earth causes the deflection to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. These winds are called the *prevailing westerlies* because of their permanency. The *prevailing westerlies* are, however, often invaded by storms, and some persons contend that they do not exist. In the United States storms occur so frequently that the westerly movement of air can be recognized only in the averages of wind movements over a period of time.[20]

2. Trade Winds.

Pressure differences cause winds to blow from the tropical belts of high pressure toward regions of low pressure at the equator. The winds blowing toward the equator become, due to the effect of the earth's rotation, northeast winds in the Northern Hemisphere, and southeast winds in the Southern Hemisphere. These are called the *trade winds.* They cover nearly half the earth's surface and blow with moderate velocity in the same direction for weeks at a time. They do no damage to life or property and, therefore, are not important from the insurance viewpoint.

3. *Doldrums.*

The horse latitudes have been explained. To complete the explanation of Figure No. 1, the doldrums must be described.

The equatorial belt of calms is called the *doldrums.* In this belt the air is warm, moist and somewhat stagnant before it rises to begin its journey toward the poles. The skies are frequently overcast and heavy rains occur often in the form of thunder-showers. This equatorial belt of low pressure is in many respects the opposite of the *horse latitudes* or *tropical belts of high pressure.* Tropical cyclones, with their powerful winds, originate in the doldrums.

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[18] See p. 187.
[19] See p. 185.
[20] Moore, *op. cit.*, p. 180.

Factors Modifying the General Wind System

Two factors which greatly modify the general wind system of the earth must be considered here.[21] They are largely responsible for the destructive winds of different kinds. One is the diversification of the earth's surface and the other is the annual migration of the sun. The first is intimately connected with storms travelling over the United States from the west. The second helps explain the origin of the hurricanes affecting the southeastern part of the United States, especially Florida and the Gulf States.[22]

1. Diversification.

The earth's surface is greatly diversified. It contains bodies of land, water, and huge mountain ranges. These greatly affect pressure distributions through their different capacities to absorb heat from the sun. Continents are warmer during the summer than the adjacent oceans in the same latitude.[23] Being warmer, the pressure on the continents is lower than the pressure over the ocean. In the winter, the reverse is true; the land is cooler than the water and has a higher air pressure. Diversification exists also in the ocean bodies. The presence of hot and cold ocean currents produces temperature differences along the same parallels of latitude.

As a result of this unequal heating of land and water, there is a tendency for peaks and depressions of pressure to form in the various appropriate regions.[24] From what has been said about the convectional theory, it is apparent that air circulation would take place between the adjoining areas of high and low pressure. Such formations modify and break up the general wind system with its high and low pressure belts which encircle the earth. These peaks and depressions are often referred to as *permanent highs and lows* or *centers of action*. They are closely connected with, if not the origin of wandering *highs* and *lows* which are the causes of storms throughout the world.[25]

Observations have shown that eight *highs* and six *lows* exist throughout the world.[26] Of the *highs* five are nearly permanent; one is located in the North Pacific opposite California; one in the North Atlantic, west of Spain; one in the South Pacific; one in the South Atlantic; and one in the Indian Ocean. Of the six *lows*, four are located in the equatorial belt of low pressure and dis-

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[21] Milham, *op. cit.*, p. 169.
[22] The reading of Chapter I will explain these statements.
[23] *Cf. ibid.*, p. 15 for the reasons.
[24] Some authorities suggest other causes for these abnormal distributions. *Cf.* Bowie, E. H. and Weightman, R. H., *Types of Storms and Their Average Movements*, Monthly Weather Review, Suppl. 1, 1914.
[25] *Cf.* Bowie and Weightman, *ibid.*, p. 4.
[26] Milham, W. I., *op. cit.*, pp. 172–173.

appear during the winter. Of the other two, one is located near Ireland, and the other, called the Aleutian Low, just south of Alaska. The former exists throughout the year, while the latter disappears during the summer. This Aleutian low is very important from the standpoint of the windstorm hazard in the United States.[27] A change north or south of its normal position will cause like changes in the character and course of storms crossing the United States.[28]

2. *Migration of the Sun.*

The second factor to be considered as modifying the general wind system is the so-called migration of the sun. The sun itself does not move. The axis of the earth is inclined 23½ degrees toward the plane of its orbit and during the course of the year this causes a change in the presentation of the two hemispheres to the rays of the sun. As a result, the sun's rays (on the face of the earth) move 47 degrees in the course of the year, being the farthest south on the 21st of December, and the farthest north on the 21st of June each year.

Migration of the sun causes a movement of the equatorial heat belt and with it, a movement of the equatorial belt of low pressure or the doldrums. The wind system of the earth is correspondingly affected. It moves, however, only about 5 or 6 degrees, with a lag of about two months behind the sun.

This movement of the wind system is important in that it explains the occurrence of most of the West Indian hurricanes during the months of August, September, and October. The sun is farthest north on June 21st. A two months lag in the wind system would cause these tropical storms to occur in the late summer months during the time the doldrums appear farthest north of the equator.[29]

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[27] Bowie & Weightman, *op. cit.*, p. 2.

[28] A second result which comes from diversification of the earth's surface is the existence of monsoons, land and sea breezes, and the mountain and valley breezes. Winds of this class are not destructive. See Milham, W. I., *op. cit.*, p. 174.

[29] See p. 23 for an explanation of the formation, paths travelled, etc. of hurricanes.

APPENDIX "B"

Stock Company Standard Windstorm Policy

(Eastern Form)

Amount, $..... Rate..... Premium, $.....

In consideration of the Stipulations herein named and of.....
.....Dollars Premium
does insure.....
and legal representatives, to the extent of the actual cash value (ascertained with proper deductions for depreciation) of the property at the time of loss or damage, but not exceeding the amount which it would cost to repair or replace the same with material of like kind and quality within a reasonable time after such loss or damage, without allowance for any increased cost of repair or reconstruction by reason of any ordinance or law regulating construction or repair and, unless otherwise specifically provided for hereinafter, without compensation for loss resulting from interruption of business or manufacture, for the term of.....
from the..... day of ..... 19.., at noon,
to the..... day of ..... 19.., at noon,
against all DIRECT LOSS AND DAMAGE BY WINDSTORM, CYCLONE and TORNADO except as herein provided,

to an amount not exceeding.....Dollars,
to the following described subject of insurance while located and contained as described herein, but not elsewhere, to wit:

Ownership, etc. This entire policy shall be void, unless otherwise provided by agreement in writing added hereto, if the interest of the insured be other than unconditional and sole ownership; or if the subject of insurance be a building on ground not owned by the insured in fee simple; or if any change, other than by the death of an insured, take place in the interest, title or possession of the subject of insurance (except change of occupants); or if this policy be assigned before a loss.

Uninsurable and excepted property. This policy shall not cover accounts, bills, bullion, currency, deeds, evidences of debt, money, notes, securities or manuscripts; nor grain, hay, straw, or other crops outside of buildings; nor radio aerials and their supports; nor, unless specifically named heron in writing, automobiles, tractors and other self-propelled vehicles, awnings, books of account, casts, cranes or hoisting apparatus unless in enclosed

buildings, curiosities, drawings, drilling rigs, electric or telephone or telegraph transmission wires and their supports outside of buildings, fences, jewelry, live stock, lumber, medals, metal stacks, models, oil derricks and/or pumping rigs, patterns, pictures, radio towers, scientific apparatus, sculpture, signs, silos or their contents, sheds unless entirely enclosed or their contents, standpipes, windmills or windpumps and their towers, water towers or water tanks and their supports, other tanks or contents of such tanks and their supports, tramways or trestling and/or their superstructures or their contents, temporary roofs, temporary roof structures or their contents, temporary or board-roof additions or their contents; nor buildings or contents of buildings in process of construction or reconstruction unless entirely enclosed and under permanent roof with all outside doors and windows permanently in place; nor articles, materials or other personal property and/or open structures not otherwise specifically excluded hereunder outside of enclosed buildings.

Hazards not covered. This company shall not be liable for loss or damage, whether incidental to a windstorm, cyclone and/or tornado or not, caused by frost or cold weather; nor for loss or damage caused directly or indirectly by cloudburst, explosion or lightning; nor for loss or damage caused directly or indirectly by tidal wave, high water or overflow whether driven by wind or not; nor by civil commotion; nor by military or usurped power; nor by order of any civil authority; nor by theft, whether occurring during or after a windstorm, cyclone and/or tornado; nor by neglect of the insured to use all reasonable means to save and preserve the property during and after a windstorm, cyclone and/or tornado.

Hazards conditionally covered. (a) This company shall not be liable for loss or damage caused by rain and/or snow, whether driven by wind or not, unless any building herein described shall first sustain an actual opening in roof and/or walls by the direct force of a windstorm, cyclone and/or tornado, and shall then be liable only for such loss or damage to the subject of insurance as may be caused immediately by rain and/or snow entering the building through openings in roof or wall as the direct result of such windstorm, cyclone and/or tornado; nor for loss or damage caused by water from sprinkler equipment or other piping unless such equipment and/or piping be damaged as a direct result of a windstorm, cyclone and/or tornado. (b) This company shall not be liable for loss or damage by fire, whether caused by windstorm, cyclone and/or tornado or not, except that in case any building herein described, or any material part of such building, fall as a direct and immediate result of a windstorm, cyclone and/or tornado, this policy shall extend to cover only such direct loss or damage by fire to the subject of insurance, according to the conditions of this policy, as may result from fire immediately following as a direct result of such windstorm, cyclone, and/or tornado; provided, however, that in no case shall

this policy extend to cover any loss or damage by fire unless all insurance against loss or damage by fire, if there be any such insurance, has ceased because of the falling of said building, or any material part thereof, as the result of such windstorm, cyclone and/or tornado.

Hazards not covered except by special agreement. Unless otherwise provided by agreement in writing added hereto, this company shall not be liable for loss or damage caused by hail, whether driven by wind or not, nor, except as otherwise provided hereinbefore, for any other consequential loss.

Fall or Destruction of building. If a building, or any material part thereof, fall or be destroyed except as the result of a windstorm, cyclone and/or tornado, all insurance by this policy on or in respect of such building, or its contents, shall immediately cease.

Pro rata liability. This company shall not be liable for a greater proportion of any loss or damage to the subject of insurance than the amount hereby insured shall bear to the whole insurance covering the subject of insurance against loss or damage by windstorm, cyclone and/or tornado, whether valid or not and whether collectible or not, regardless of whether other insurance covering the subject of insurance against loss or damage by windstorm, cyclone and/or tornado shall extend to cover the subject of insurance in accordance with the conditions of this policy.

Plate glass. This policy shall not cover any plate, stained, leaded or cathedral glass when such glass is covered against loss by breakage under any other kind of insurance policy or contract. When such glass is not otherwise covered, this policy shall extend to cover such glass; it being expressly stipulated that when such glass is covered hereunder, only such proportion of the insurance under this policy on any building covered hereunder covers on plate, stained, leaded or cathedral glass therein as the value of such glass bears to the value of said building, and the amount of insurance on such glass, so ascertained, shall apply to each plate of glass covered hereunder in the proportion that the value of each plate of glass bears to the total value of all such glass.

(The windstorm policy also contains a number of clauses which are similar to those found in the standard fire policy. These clauses pertain to: fraud, added clauses, cancellation, policy period, mortgagee interest, requirements in case of loss, appraisal, company's option, when loss is payable, suit under the policy and subrogation.)

APPENDIX "C"

Stock Company Standard Windstorm Policy

(Middle Western and Southern Form)

(Showing only the clauses which are essentially different from those contained in the Eastern Form)

Ownership. This Company shall not be liable under this policy for an amount in excess of the ownership interest of the insured in the property described; nor if any change other than by the death of the insured, take place in the interest or title of the subject of this insurance; nor if this policy be assigned without the written consent of this Company, endorsed hereon.

Uninsurable and Excepted property. This Company shall not be liable for loss or damage to accounts, bills, money, deeds, evidences of debt, securities, bullion, manuscripts, nor (unless otherwise provided by agreement in writing endorsed hereon), to casts, curiosities, drawings, medals, models, jewelry, patterns, pictures, scientific apparatus or sculpture.

Hazards not covered. This Company shall not be liable for any loss or damage caused by snowstorm, blizzard, frost or cold weather; nor for loss or damage occasioned directly or indirectly by or through any explosion, tidal wave, lightning, high water, overflow, cloudburst, theft, nor for neglect by the insured to use all reasonable means to save and preserve the property during and after a windstorm, cyclone or tornado, nor for any loss or damage by fire, except that in case any building or any material part thereof, fall as the result of windstorm, cyclone or tornado, immediately followed by fire as a direct result, then this insurance is extended to cover such resultant fire loss to only such fallen building or buildings and/or contents covered under this policy; provided, however, that if there shall be other windstorm, cyclone or tornado insurance on the property covered under this policy, this Company shall be liable by virtue of this extension of liability for the proportion only of such resultant fire loss to only such fallen building or buildings and/or contents covered under this policy, as this insurance bears to the total windstorm, cyclone or tornado insurance on such property covered under this policy, whether other such insurance does or does not cover resultant fire loss, and whether or not other insurance be valid or collectible; provided further that even though fire follow immediately as a direct result of any windstorm, the maximum liability of this Company for any or all the hazards insured hereunder shall not exceed the amount of windstorm, cyclone and tornado insurance specified on the face of this policy.

Water and Rain Damage Exclusions. This Company shall not be liable for any loss or damage caused by water or rain, whether driven by wind or not, unless the building described or containing the property described shall first sustain an actual damage to roof or walls by the direct force of the wind, and shall then be liable only for such damage to the interior of the building or the described property therein as may be caused by water or rain entering the building through openings in roof or walls made by direct action of the wind, or by water from sprinkler or other piping broken by such damage to roof or walls.

Hazards not covered except by Special Agreement. Unless otherwise provided by agreement in writing added hereto, this Company shall not be liable for any loss or damage caused by hail, whether driven by wind or not, nor for loss or damage to metal smoke stacks, awnings, signs, temporary or board roof additions, nor for loss or damage to buildings (or their contents) in process of construction or reconstruction unless same are entirely enclosed and under roof, with all outside doors and windows permanently in place.

Plate Glass Contribution. It is expressly stipulated that only such proportion of the insurance under this policy on any building covers on plate, stained, leaded or cathedral glass therein as the value of such glass shall bear to the total value of said building; and the amount of insurance on such glass as thus ascertained shall apply to each plate in the proportion that the value of each plate bears to the total value of such glass; and plate glass, accident or casualty insurance shall be deemed other insurance and treated as contributing insurance.

APPENDIX "D"

Stock Company Tornado Policy

(Pacific Form)

(Showing only the clauses which are essentially different from those contained in the Eastern Form)

In Consideration of the Terms and Stipulations Herein Named and of .....Dollars Premium does Insure.....for the term of..... from the..... day of ..... 19..., at noon, to the.....day of.....19..., at noon (standard time), against all direct loss or damage by

Tornado, Windstorm, or Cyclone, except as hereinafter provided. To an amount not exceeding.....,.....dollars, to the following described property while located and contained as described herein and not elsewhere, To Wit:

This company shall not be liable for any loss or damage caused by hail, whether driven by wind or not, snowstorms, frost or cold weather, nor for the blowing down of metal smoke-stacks (unless specifically insured), awnings, signs, temporary or board roof additions, nor for loss or damage to buildings (or their contents) in process of construction or reconstruction, unless same are entirely enclosed and under roof, with all outside doors and windows permanently in place; nor for loss or damage occasioned directly or indirectly by or through any fire, explosion, tidal wave, lightning, high-water, overflow, cloud-burst; nor by theft, nor by reason of any ordinance or law regulating the construction or repair of buildings, nor for consequential loss of any kind.

This company shall not be liable for any loss or damage caused by water or rain, whether driven by wind or not, unless the building insured or containing the property insured shall first sustain an actual damage to the roof or walls of same by the direct force of the wind, and shall then be liable only for such damage to the interior of the building or the insured property therein as may be caused by water or rain entering the building through openings in the roof or walls made by the direct action of the wind.

This company shall not be liable for loss or damage to accounts, bills, money, deeds, evidences of debt, securities, bullion, manuscripts, nor, unless expressly assumed by agreement indorsed hereon, for casts, curiosities, drawings, medals, models, jewelry, patterns, pictures, scientific apparatus, sculpture, store or office fixtures.

If there shall be any other tornado insurance or contract of tornado insurance, whether valid or not, on the property described herein, claim upon this company shall be only for such proportion of the loss as the amount of this policy shall bear to the whole insurance.

It is expressly stipulated that only such proportion of the insurance under this policy on any building covers on plate, stained, leaded or cathedral glass therein, as the value of such glass shall bear to the value of said building; and to such extent only shall this company contribute with other insurance in payment of any loss thereon; and plate glass, accident, or casualty insurance shall be deemed other insurance and treated as contributing.

In case of fire occurring subsequent to any loss or damage by tornado, windstorm, or cyclone, this company shall be liable under this policy only for such loss or damage as occurred previous to said loss or damage by fire and for no loss by fire whatever.

APPENDIX "E"

Stock Company

Oklahoma Special Dwelling Fire and Windstorm Policy

	No. DFW.	Stock Company
	Fire..... $....	Fire Rate..... $....
	Fire Rent..... $....	Fire Rent Rate..... $....
Sum	Windstorm..... $....	Windstorm Rate..... $....
Insured	Windstorm Rent... $....	Windstorm Rent Rate... $....
	Hail Rent..... $....	Hail Rate..... $....
	Unlimited Vacancy Rate.....	$....

	Fire Premium.....	$....
	Fire Rent Premium.....	$....
Premium	Windstorm Premium.....	$....
	Windstorm Rent Premium.....	$....
	Hail Premium.....	$....
	Unlimited Vacancy Premium.....	$....
	TOTAL PREMIUM.....	$....

In Consideration of the Stipulations herein named and of Respective Premiums as above, Totaling

.....Dollars Premium,

Does Insure.....for the term of.....

from the..... day of ..... 19.., at noon (Standard time)

to the ..... day of ..... 19.., at noon (Standard time)

Against all direct loss or damage by Fire and Lightning, except as hereinafter provided, to an amount not exceeding.....Dollars, and against all direct loss or damage by Windstorm, Cyclone and Tornado, except as hereinafter provided, to an amount not exceeding .....

.....Dollars, to the following described property while located and contained as described herein, and not elsewhere, to wit:

This contract consists of separate Fire and Windstorm policies covering in equal amounts against loss or damage by Fire and loss or damage by Windstorm. The following form specifies the maximum amount of insurance covering the hazards assumed under either the Fire or Windstorm policies issued hereunder the same as if a separate form were hereto attached for each such policy, subject, however, to the terms, conditions and limitations covering any liability hereunder.

City
All situated.....Town of.....State of Oklahoma.

*1 $ On DWELLING HOUSE, consisting of a Story Roof Building, with foundation and chimneys and flues, occupied and to be occupied only for dwelling purposes.

*2 $ On HOUSEHOLD AND PERSONAL EFFECTS as hereinafter described.

*3 $ On the RENTS and/or RENTAL VALUE of the above described dwelling house

*4 $ On the roof BUILDING, OCCUPIED AS A PRIVATE GARAGE AND/OR PRIVATE BARN.

*5 $ On Horses and Cows, subject to limitations on inside pages of policy, and

*6 $ On VEHICLES (excepting automobiles and motorcycles), Robes, Horse and Carriage Equipment, all only while contained in above described Private Garage and/or Private Barn.

*7 $ On SHEDS, OUTBUILDINGS AND FENCES on above described premises.

*8 $ On

$ Total Insurance.

All items as described, defined and limited hereon and on the following pages hereof are hereby referred to and made a part of this policy of insurance.

The provisions printed on the third page of this policy relating to Rent and/or Rental Value are hereby referred to and made a part hereof when a certain amount is specified and inserted in blank immediately preceding Item No. 3.

*No insurance attaches under any of the above items unless a certain amount is specified and inserted in blank immediately preceding the item.

This insurance shall also cover under Item No.....the fuel oil tank, including connections, located.....

Note: For information only—The above described dwelling is occupied, or to be occupied, by.....families.

MORTGAGE CLAUSE—Loss or damage, if any, under this policy, shall be payable to .....
Mortgagee (or Trustee) as interest may appear, subject to the conditions of the Mortgage Clause printed elsewhere in this policy.

UNLIMITED VACANCY PERMIT—Note: The additional premium must be inserted in the space provided therefor in this permit and also in-

cluded in the premium named in the face of the Policy, otherwise this permit is void. In consideration of $..... additional premium, permission is granted for the premises described in this Policy to remain vacant or unoccupied during the entire life of the Policy.

HAIL CLAUSE—Note: The additional premium must be inserted in the space provided therefor in this clause and also included in the premium named in the face of the Policy, otherwise this clause is void. In consideration of $..... extra premium, this policy is hereby extended to cover direct loss or damage by Hail, subject to all its terms, conditions and stiuplations and those of all riders attached thereto; the total liability for loss or damage caused by windstorm, cyclone, tornado and/or hail, either separately or together, not to exceed the total amount of this policy in effect at the time of loss. If there is other windstorm, cyclone and tornado insurance upon the property damaged, this Company shall be liable only for such porportion of any direct loss or damage caused by Hail as the amount hereby insured bears to the whole insured thereon whether such other said insurance contains a similar clause or not. It is a further condition of this insurance that this Company shall not be liable for loss or damage caused by Hail to hay, grain, or straw, in fields or in stacks.

Not exceeding ten (10) per cent of the amount of any item of this policy on personal property shall cover also, as per above form, property of guests and servants, loss, if any, to be adjusted with and payable to the insured named in this policy.

Permission granted for such use of the premises as is usual and incidental to the occupancy as described herein, and to keep and use all articles and materials usual and incidental to such occupancy in such quantities as the exigencies of the occupancy require.

It is a condition of this insurance that the attached Awnings and Radio equipment on the outside of the building are not covered under the Windstorm, Cyclone and Tornado insurance granted hereunder.

THE PROVISIONS PRINTED ON THE THIRD PAGE OF THIS POLICY RELATING TO DIRECT PROPERTY LOSS ARE HEREBY REFERRED TO AND MADE A PART HEREOF,

This Policy is made and accepted subject to the foregoing and following stipulations and conditions, together with such other provisions, agreements, or conditions as may be endorsed hereon or added hereto, and no officer, agent, or other representative of this Company shall have power to waive any provision or condition of this policy except such as by the terms of this policy may be the subject of agreement endorsed hereon or added hereto, and as to such provisions and conditions no officer, agent, or representative shall have such power or be deemed or held to have waived such provisions or conditions unless

such waiver, if any, shall be written upon or attached hereto, nor shall any privilege or permission affecting the insurance under this policy exist or be claimed by the Insured unless so written or attached. (The stipulations and conditions above referred to are set forth on the following pages of this policy.)

COUNTERSIGNED at the Agency of this Company at
this day of 19

.....*Agent.*

(NOTE: The policy contains the usual clauses found in the standard fire contract, such as the appraisal, subrogation, etc. clauses. These clauses are omitted here.)

The following PROVISIONS AND CONDITIONS ARE APPLICABLE ONLY TO COVERAGE AGAINST LOSS OR DAMAGE BY WINDSTORMS, CYCLONES AND TORNADOES.

Except as limited or changed by the conditions herein provided as applicable to windstorms, cyclones and/or tornadoes, lines 1 to 112 inclusive of this policy as set out above, are adopted herein and made a part hereof, and wherever the word "fire" occurs, it shall be held to mean "windstorm, cyclone and/or tornado."

This Company shall not be liable for any loss or damage caused by snowstorm, blizzard, frost or cold weather; nor for any loss or damage to grain, hay or straw in stacks, windmills, wind-pumps or their towers, whether blown down or not; nor for loss or damage to other property caused by the blowing down of windmills, wind-pumps or their towers, unless such other property also sustains other loss or damage caused by wind; nor for loss or damage occasioned directly or indirectly by or through any explosion, tidal wave, high water, overflow, cloudburst, theft; nor for any loss or damage, caused by water or rain, whether driven by wind or not, unless the building insured, or containing the property insured, shall first sustain an actual damage to the roof or walls by the direct force of the wind, and shall then be liable only for such damage to the interior of the building or the insured property therein, as may be caused by water or rain entering the building through openings in the roof or walls made by the direct action of the wind, or by water from sprinkler or other piping broken by such damage to roof or walls.

Unless liability therefor is assumed by specific endorsement hereon, this Company shall not be liable for any loss or damage caused by hail, whether driven by wind or not, nor for loss or damage to metal smokestacks, awnings, signs, temporary or board roof additions, nor for loss or damage to buildings (or their contents) in process of construction or reconstruction unless same are entirely enclosed and under roof, with all outside doors and windows permanently in place; nor for consequential loss or damage of any kind, except that in

case any building or any material part thereof, fall as the result of windstorm, cyclone or tornado, immediately followed by fire as a direct result, then this insurance is extended to cover such resultant fire loss to only such fallen building or buildings and/or contents covered under this policy, not exceeding, however, the amount of liability specified under the tornado conditions in this policy; provided, however, that if there shall be other windstorm, cyclone or tornado insurance on the property covered under this policy, this Company shall be liable by virtue of this extension of liability for the proportion only of such resultant fire loss to only such fallen building or buildings and/or contents covered under this policy, as this insurance bears to the total windstorm, cyclone or tornado insurance on such property covered under this policy, whether other such insurance does or does not cover resultant fire loss, and whether or not other insurance be valid or collectible.

It is expressly stipulated that only such proportion of the insurance under this policy on any building covers on plate, stained, leaded or cathedral glass therein, as the value of such glass shall bear to the total value of said building; and the amount of insurance on such glass as thus ascertained shall apply to each plate in the proportion that the value of each plate bears to the total value of such glass; and plate glass, accident or casualty insurance shall be deemed other insurance and treated as contributing.

The conditions elsewhere in this policy relating to encumbrance, change in occupancy, artificial lighting, and keeping explosives and inflammable oils shall not apply to Windstorm, Cyclone and/or Tornado insurance granted hereunder.

Even though fire follow immediately as a direct result of any windstorm, the maximum liability of this company for any or all the hazards insured hereunder shall not exceed the amount of windstorm, cyclone and tornado insurance specified on the face of this policy.

IN WITNESS WHEREOF, this Company has executed and attested these presents; but the same shall not be valid until countersigned by the duly authorized Agent of this Company at the Agency hereinbefore mentioned.

Attest:

Secretary *President*

DESCRIPTIONS, DEFINITIONS, LIMITATIONS AND PERMITS.

The terms "DWELLING HOUSE," "PRIVATE GARAGE" AND/OR "PRIVATE BARN" shall mean the building, including foundations, plumbing, electric wiring and stationary heating, lighting and ventilating apparatus and fixtures therein; awnings (awnings covered against fire only), door and window screens, and storm doors and windows; also all permanent fixtures belonging to and constituting a part of said building; occupied, and to be occupied only for the respective purpose named.

If the building hereby insured is occupied by tenants, this insurance shall also cover under this item, if the property of owner of building, and not otherwise insured, floor coverings, mirrors, stoves, refrigerators, cleaning apparatus, hose and other fire extinguishing appliances, fuel, janitor's tools and implements, all constituting a part of the equipment and service of the building and only while contained in, or attached to, the within described building.

This insurance shall also cover under this item, if the property of owner of building, awnings, door and window screens and storm doors and windows, belonging to within described building, while stored in outbuildings on the within described premises.

The term "HOUSEHOLD AND PERSONAL EFFECTS" shall mean household and personal effects of every description (printed books, musical instruments, pictures, paintings, engravings, including their frames, statuary and sculpture to be valued at not exceeding cost) belonging to insured and all members of the insured's family, usual or incidental to the occupancy of the premises by the insured as a dwelling, excluding bills of exchange, accounts, bills, currency, deeds, evidences of debt, money, notes or securities; all while contained in the building described in item No. 1, and if not otherwise specifically insured, while stored in outbuildings on the within described premises, but the liability of this company for loss or damage to household and personal effects in outbuildings shall not exceed ten (10) per cent of the amount of insurance under this item.

This insurance shall also include the interest or liability under contract of the insured in articles, covered under this item, purchased on the installment plan.

RENT AND/OR RENTAL VALUE PROVISIONS REFERRED TO IN AND MADE A PART OF THIS POLICY WHEN A CERTAIN AMOUNT IS SPECIFIED AND INSERTED IN BLANK IMMEDIATELY PRECEDING ITEM NO .3.

When liability is assumed under Item No. 3, wherever the words "loss or damage" appear in the Lightning and Electrical Apparatus Clause A, they shall be construed to mean "loss of rents and/or rental value."

The term "rents and/or rental value" wherever used in this policy shall mean the determined rents and/or rental value, less such charges and expenses as do not necessarily continue after the fire.

In case the within described building, or any part thereof, whether rented at the time or not, shall be rendered untenantable by fire, this company shall be liable to the insured for not exceeding the actual loss sustained based upon loss or rents and/or rental value of such untenantable parts not exceeding the sum insured, nor more than one-twelfth of that amount for any one month, and proportionate part thereof for any period less than one month, loss to be com-

puted from the date of the occurrence of said fire, and to be determined by the time it would require, under ordinary circumstances, to put the premises in tenantable condition; and in case any portion of the building herein described shall be occupied by the insured, for his own use, this policy shall extend to and cover the rental value of such portion so occupied, in the same manner as if under lease to a tenant.

If the event of a disagreement as to the time that would be required, under ordinary circumstances, to restore the building to the same tenantable condition as before the fire, or as to the rents and/or rental value of the building or any part thereof, the same shall be determined by appraisement in the manner provided in the printed conditions of this policy.

Wherever the word "fire" appears in the above Rent and/or Rental Value Provisions it shall be construed to mean Fire, Windstorm, Cyclone or Tornado.

"HORSES AND COWS"—In case of loss this company will not be liable for more than $250 on any one horse, or more than $100 on any one cow, and only for its pro rata proportion thereof in case of other insurance; only while contained in within described barn, and against loss by lightning while on or off the premises.

The term "VEHICLES" shall also include (excepting automobiles and motorcycles), robes, horse, and carriage equipment, bicycles in use; hay grain, feed, coal, and wood; mechanics', carpenter, barn and garden tools and implements; all only while contained in within described Private Garage and/or Private Barn.

DIRECTED PROPERTY PROVISIONS REFERRED TO IN AND MADE PART OF THIS POLICY

Permission granted for the within described premises to be and remain vacant for a period not exceeding sixty (60) days at any one time, the term "vacant" being construed to mean an empty building devoid of personal habitation; or to be and remain unoccupied for a period not exceeding six (6) months at any one time, the term "unoccupied" being construed to mean a building that is entirely furnished, but with personal habitants temporarily absent.

It is made a condition of this insurance that the premises shall be kept properly closed and secured to prevent trespassing or the entrance of unauthorized persons during the term of vacancy or unoccupancy.

(Applicable to fire cover only)—If the premises are vacant for a period exceeding sixty (60) days, or unoccupied for a period exceeding six (6) months, at any one time, this policy is void unless a special form of permission therefor is attached hereto.

Other insurance permitted; provided, however, if a Three-fourths Value

Clause applies to this policy this permit is made subject to all the conditions of said Three-fourths Value Clause.

Permission granted to make alterations, improvements and repairs to any buildings herein described, and to complete same if under construction, and the insurance, if any hereunder, on such building is hereby extended and made to cover such alterations, improvements and repairs, and the building materials and supplies therefor or entering into the construction of such building, while contained therein or on the premises immediately adjacent thereto.

(An inherent explosion clause and a lightning and electrical apparatus clause are also included.)

APPENDIX "F"

Stock Company Supplemental Contract (New Jersey)

FOR LOSS OR DAMAGE BY FALLING AIRCRAFT EXPLOSION, HAIL, RIOT AND/OR WINDSTORM

The Insurance Company named below, in consideration of $..... premium and the issuance of the fire insurance policy to which this Supplemental Contract is attached, does hereby insure the insured named in said policy, on the property covered thereby under the items and in the amounts designated below, against all direct loss or damage caused by falling aircraft, explosion, riot, hail and/or windstorm, for such period of time as said policy continues in force, and no longer.

Except as limited or changed by the conditions herein provided as applicable to "falling aircraft," "explosion," "hail," "riot," and/or "windstorm," all of the TERMS, LIMITATIONS AND CONDITIONS of the FIRE POLICY (including riders and endorsements) t which this Supplemental Contract is attached, are adopted herein and made a part hereof, and wherever the word "fire" occurs, it shall be held to mean "falling aircraft," "explosion," "hail," "riot," and/or "windstorm".

Amount Insured	Property Covered (As described in the Fire Insurance Policy to which this Contract is attached)
$.....	On property described under Item No.....
$.....	On property described under Item No..... ....
$.....	On rents described under Item No.....
$.....	On rents described under Item No.....

This Company shall be liable only for loss or damage to the property described in items having the amount of insurance thereon filled in, and if no amount is named in any one or more of the above items, no liability for loss or damage to property described in such item or items is assumed under this Supplemental Contract.

Exclusion of cost of excavation and foundations. The above items, if any, applying to buildings do not cover cost of excavation or foundations which are below he under surface of the lowest basement floor, or, when there is no basement, which are below the surface of the ground.

Exclusion of Rain, Snow and Water Damage. This Company shall not be liable for loss or damage caused by rain and/or snow, whether driven by wind or not, unless any building covered hereby shall first sustain an actual opening in roof and/or walls by the direct force of Falling Aircraft, Explosion, Hail,

Riot and/or Windstorm, and shall then be liable only for such loss or damage to the subject of insurance as may be caused by rain and/or snow immediately entering the building through opening in roof and/or walls as the direct result of such damage by Falling Aircraft, Explosion, Hail, Riot and/or Windstorm, nor for loss or damage caused by water from the sprinkler equipment or other piping, unless such equipment or piping be damaged as a direct result of Falling Aircraft, Explosion, Hail, Riot and/or Windstorm.

SPECIAL CONDITIONS APPLICABLE TO DAMAGE FROM FALLING AIRCRAFT.

The term "Falling Aircraft" shall be held to mean falling airplanes, airships and/or other aerial craft or objects falling therefrom.

This Company shall not be liable under this Supplemental Contract for loss or damage caused by such motor-propelled devices, owned or operated by the owner of the property covered hereunder and/or by any tenant thereof and/or by any member of the family or employee of either.

Airplane Exclusion. This Company shall not be liable for loss or damage to an airplane or any other self-propelled vehicle, or parts thereof, under this Supplemental Contract.

SPECIAL CONDITIONS APPLICABLE TO RIOT LIABILITY

The term "riot" shall be held to include Riot attending a Strike, Insurrection and/or Civil Commotion.

SPECIAL CONDITIONS APPLICABLE TO EXPLOSION LIABILITY

This Supplemental Contract covers all direct loss or damage by Explosion, excluding explosion originating within steam boilers, pipes, fly-wheels, engines, motors and machinery connected therewith and/or operated thereby.

SPECIAL CONDITIONS APPLICABLE TO WINDSTORM AND/OR HAIL LIABILITY

This Supplemental Contract shall not cover awnings, electric or telephone or telegraph transmission wires and their supports outside of buildings, fences, silos or their contents, greenhouses or similar buildings largely of glass construction or their contents, standpipes, windmills or wind-pumps and their towers, water towers or water tanks and their supports, other tanks or contents of such tanks and their supports, temporary roofs, temporary roof structures or their contents, temporary or board additions or their contents; nor buildings or contents of buildings in process of construction or reconstruction, unless entirely enclosed and under permanent roof with all outside doors and windows

permanently in place; nor articles, materials or other personal property and/or open structures not otherwise specifically excluded hereunder outside of enclosed buildings.

This Company shall not be liable for loss or damage, whether incidental to a windstorm or not, caused by frost or cold weather; nor for loss or damage caused directly or indirectly by cloudburst; nor for loss or damage caused directly or indirectly by tidal wave, high water or overflow, whether driven by wind or not.

FALL OF BUILDING AND FIRE LIMITATION CLAUSE

This Company shall not be liable under this Supplemental Contract for any loss or damage by fire whether direct or indirect (excepting loss or damage caused by riot as defined in this Supplemental Contract) unless all liability under any and all fire insurance policies covering property insured hereunder has ceased because of the fall of the building (s) or material part thereof in which event the Company shall be liable under this Supplemental Contract (subject to all the terms, conditions and limitations of this contract and the policy to which it is attached) for the direct loss or damage by fire to the property covered hereby which immediately follows the fall of any such building (s) or material part thereof, and then only if such fall is the direct and immediate result of damage caused by Falling Aircraft, Explosion, Hail, and/or Windstorm.

CONTRIBUTION FROM OTHER INSURANCE

If there should be any other insurance covering in any manner loss caused by any of the hazards covered hereby affecting property covered by this Supplemental Contract, this Company shall only be liable hereunder pro rata with such other insurance.

Total Liability. The total liability of this insurance company for all of the hazards covered under this Supplemental Contract shall not exceed the total amount applying to each of the items thereof.

CO-INSURANCE CLAUSE

Applicable to this Supplemental Contract only except the rent items, if covered. In consideration of reduced rate of premium at which this policy is written the Standard Percentage Co-Insurance Clause of the State of New Jersey is attached to and made a part of this policy.

New Jersey Standard Percentage Co-Insurance Clause

If at the time of fire the whole amount of insurance on the property covered by this policy shall be less han ..... percent of the actual cash value

thereof, this Company shall, in case of loss or damage, be liable for only such portion of such loss or damage as the amount insured by this policy shall bear to the said ..... percent of the actual cash value of such property.

If this policy be divided into two or more items the foregoing Co-Insurance Clause shall apply to each item separately.

Attached to Policy No. ..... of THE BLANK FIRE INSURANCE COMPANY, ...

IN WITNESS WHEREOF, this Company has executed and attested these presents; but this policy shall not be valid until countersigned by duly authorized Agent of this Company.

Vice-President and Secretary *President*

Countersigned at ..... this ..... day of ....., 19...

....., *Agent.*

APPENDIX "G"

Stock Company Mortgage Interest Form For Building and Loan Association, Bank, Trust Company or Mortgage Loan Corporation

(FIRST MORTGAGEE)

(Eastern Form)

$..... On the several properties on which the .... shall have subsisting loans owned by the insured at the time when any of the said properties, during the term of this insurance, suffer loss or damage by tornado, cyclone or windstorm while located within the limits of.....and/or City and County of ..... State of ..... excluding.....

This insurance being designed to cover only the first mortgage interest of the ..... in each of said properties: It is hereby made an express condition of this contract that no claim shall be made hereunder against this company for any loss or damage by tornado, cyclone or windstorm until such loss or damage on any one building, in excess of any and all specific tornado insurance thereon, in favor either of the first mortgagee or mortgagor, has impaired the security of said ..... to such an extent that the value of land as appraised at the time the loss occurred in the manner provided in the printed conditions of this policy, and the remaining value of the building plus the specific insurance, if any, do not equal the balance due under the first mortgage interest of the insured on the damaged property, and then only for the difference between the value of the property remaining plus the specific insurance, if any, and the amount due on the first mortgage interest of the insured on said property not exceeding $..... on any one building.

In consideration of the rate and form of this policy, it is a condition of this insurance that the liability assumed by this company hereunder shall be only such proportion of the actual loss or damage above specified, as the amount covered under this policy bears to 25 per cent of the total amount of the outstanding loans owned by the insured within the territory described in this policy at the time of any loss or damage by tornado, cyclone or windstorm; but if the total first mortgage interest insurance upon such property exceeds 25 percent at the time of such loss, then this company shall be liable for the

proportion which the sum hereby covered bears to such total first mortgage interest insurance, not exceeding the actual amount of loss to the first mortgagee's interest in the property covered.

It is a condition of this insurance that this policy does not cover the first mortgage interest of said ..... in any manufacturing building or any building wherein the business of any occupancy consists principally of converting raw or partially wrought materials into wares of merchandise or articles which are different in any respect from the raw or partially wrought materials before they enter the process of conversion, nor any farm building which is situated on a tract of land containing more than three acres of ground and used for farming purposes, whether located inside or outside the corporate limits of cities, towns or villages.

Whenever this company shall pay the insured any sum of loss or damage under this policy this company may, at its option, to the extent of such payment, be thereupon legally subrogated to all the rights of the party to whom such payment is made and to all the securities held as collateral to the first mortgage debt; or it may, at its option, pay to the insured the whole principal due or to grow due thereon with interest and shall thereupon receive a full assignment and transfer of the insured's first mortgage debt and of all such securities held as collateral to such first mortgage debt; but no subrogation shall impair the right of the insured to recover the full amount of its claim.

Other insurance permitted.

APPENDIX "H"

Stock Company Tornado Rider
Blank Fire and Marine Insurance Company

WESTERN DEPARTMENT

In Consideration of the Extra Premium this Fire Policy is hereby extended to cover the property herein described against all direct loss or damage by CYCLONE, TORNADO AND WINDSTORM.

subject to all the conditions, requirements and limitations herein named, except as hereinafter provided.

This Company shall not be liable for any loss or damage caused by tornado, cyclone or high wind to hay, straw or grain in cocks, shocks or stacks; growing crops; dilapidated buildings, open sheds, temporary or board-roof additions, buildings covered with hay, straw or thatched roofs, or rubberoid roll, felt roll or composition roll roofing, or to buildings standing on posts or pins not sheathed or banked up (or to contents of same); awnings, signs or fences; horses, cattle, hogs or other live stock resulting from animals being blown, drifting or running into wire fences and thereby being cut or otherwise injured: Nor, unless liability is specifically assumed in writing hereon and additional premium paid therefor, this Company shall not be liable for any loss or damage caused by hail or the blowing down of metal smokestacks, windmills, windpumps, windpowers or silos, whether attached to buildings or not; for any loss or damage to buildings in process of construction, or undergoing repair, unless the same are entirely enclosed and under roof, with all outside doors and windows permanently in place.

Nor, unless other material damage occur to the buildings hereby insured, this Company shall not be liable for any loss or damage caused by the blowing down of chimneys, eaves-troughs, spouting or lightning rods, or the blowing off of loose clapboards or shingles, or the breaking of doors, windows or window-blinds.

This Company shall not be liable for any loss or damage to any of the property hereby insured caused by any of the following agencies, either directly or indirectly, and whether driven or accompanied by wind or not, to wit: frost, cold weather, snow, blizzards or freezing; tidal wave, cloudburst, flood or overflow; nor for any loss or damage caused by water or rain, except when admitted through openings made by wind in roof or walls of a building.

Attached to and forming part of Policy No. ..... of the BLANK FIRE AND MARINE INSURANCE COMPANY, of ...., issued at its ....Agency.

Dated ....., 19... ....., *Agent.*

APPENDIX "I"

Wind Damage Clause.

Associated Factory Mutual Fire Insurance Companies

Wind Damage

This Policy also covers the direct loss or damage which may be caused by the direct action of wind and/or hail whether accompanied by wind or not, under the same conditions and to the same property insured against fire by this Policy, for an amount not exceeding fifty percent. of the amount herein insured against fire, subject to the following exclusions:

new buildings or additions or buildings under reconstruction (until closed in by walls, roofs, doors and windows) and contents of same, signs, awnings and all property in yard outside of buildings not a fixed structure or any part thereof. This Company shall not be liable by the terms of this clause for any loss or damage caused by rain, snow, sand or dust, unless the same shall enter the building where concurrently broken open by the direct force of the wind or by substance driven by the wind or by hail, nor for any loss or damage caused when a snow-load and/or ice-load are contributing factors to the fall or collapse of a building or structure or any part thereof, nor for any loss or damage caused by floods of whatever nature. This Company shall be liable for only such proportion of the loss or damage by wind or by hail as the amount herein insured against fire upon the property damaged, bears to the total amount of fire insurance thereon, except that when the total amount of wind or hail insurance upon the property damaged exceeds twenty-five percent of the total fire insurance thereon, this Company shall be liable for only such proportion of the loss or damage by wind or hail as the amount insured against wind or hail by this policy bears to the total amount of wind or hail insurance thereon, whether or not the other fire or wind or hail insurance contracts contain a similar clause. If the insurance under this Policy be divided into two or more items, the foregoing shall apply to each item separately.

Attached to and forming part of Policy Contract No.

Assistant Secretary.

APPENDIX "J"

Mutual Windstorm Insurance Company Policy

BY THIS CERTIFICATE OF INSURANCE

BE IT HEREBY KNOWN THAT.....Whose Postoffice is ..... Whose Property is Located in the Township of ..... County of ..... State of Michigan, has this ..... day of ..... 19.. become a member of

THE BLANK MUTUAL WINDSTORM INSURANCE COMPANY

Of The State of Michigan, according to the Charter and By-Laws, and has insured in said Company Against Loss or Damage by Tornado, Cyclone or Windstorm, to the amount of $..... on property specified below:

On Dwelling No. 1.....	$.....	On Tool House.....	$.....
On contents while therein.	$.....	On Hen House.....	$.....
On Dwelling No. 2.....	$.....	On Hog House.....	$.....
On contents while therein.	$.....	On Silo well anchored.....	$.....
On Barn No. 1.....	$.....	On Corn Barn.....	$.....
On contents while therein.	$.....	On contents while therein.	$.....
On Barn No. 2.....	$.....	On Store.....	$.....
On contents while therein.	$.....	On contents while therein.	$.....
On Granary No. 1.....	$.....	On Church.....	$.....
On contents while therein.	$.....	On contents while therein.	$.....
On Garage.....	$.....	On School House.....	$.....
On Live Stock and Poultry in the State of Michigan.	$.....	On contents while therein.	$.....
On Farm tools, Implements, Vehicles and Automobiles, while in said buildings or in the State of Michigan.....	$.....	On Windmill in good condition.....	$.....
		On.....	$.....
		On.....	$.....
		On.....	$.....
		On.....	$.....
On Hay, Grain and Farm Products in any building, insurable by the Company.....	$.....	On.....	$.....
		On.....	$.....
		On.....	$.....
		Total.....	$.....

Situated on Section.....Township of.....
County of.....and State of Michigan.....

AND THE SAID COMPANY do hereby promise and agree to make good unto the said insured or ..... legal representatives, all such loss or damage, not exceeding in amount the sum insured, as shall happen by Tornado, Cyclone or Windstorm to the property above named, and more specifically described in the application on file in the office of the Secretary-Treasurer of this Company, which is hereby made a part of this contract, from the ..... day of ..... one thousand nine hundred and ....., at twelve o'clock noon, the said loss or damage to be estimated according to the actual cash value at the time the same shall happen; to be paid within sixty days after due notice and proofs of the same, made by the insured as hereinafter provided, are received at the office of this company; provided, however, that the Company may repair, rebuild, restore or replace the property lost or damaged, on giving notice of such intention, within sixty days after receipt of the proofs herein required.

The Company Expressly Reserves the Right to Cancel This Policy at any Time Upon Good and Sufficient Reasons.

Secretary-Treasurer *President*

CHARTER

(Articles of the Charter, other than the following, are omitted because they pertain to organization and not insurance.)

Article III. Application for membership in the Company shall be accompanied by a membership fee of One Dollar, and in addition thereto the sum of Fifteen Cents per One Hundred Dollars for the amount of insurance applied for on all property except greenhouses, which shall pay such rate as may be fixed by the Board of Directors, they to use their discretion in fixing the rate in accordance with the hazard. Any member may enlarge or diminish the schedule of his or her insurance by paying a fee of Fifty Cents; and if his or her insurance is increased, by paying a fee of Fifteen Cents on each One Hundred Dollars increase on all property except greenhouses, on which the fee shall be fixed by the Board of Directors. Members shall be subject to a ratable assessment based on the amount of insurance, to defray losses and expenses of the Company, except members insuring greenhouses. All policies insuring greenhouses shall be subject to an annual assessment adequate to defray losses on greenhouses and their portion of the expenses of the Company. Such assessments when ordered by the Board of Directors shall be given to the members by the Secretary-Treasurer by mailing such notice to their last known postoffice address, and if such assessment is not paid within thirty days the policy shall stand suspended, and the Company shall not be liable for any loss

after the lapse of the said thirty days. Such assessments, together with interest and costs, if not paid within thirty days from the date of mailing such notice shall constitute a debt to the member and a lien upon the property insured until fully paid.

The Board of Directors is further given power and authority to create, and shall create, a fund to be known as an Emergency Fund, which when created shall be used solely for the payment of future losses and expenses of the Company, in order to save the payment of interest on borrowed money or to meet any emergency that may arise from time to time.

That the Company shall establish and maintain said Emergency Fund, and any portion of assessments paid by a member and not used in the payment of losses, and expenses already incurred, shall be transferred to said Emergency Fund.

Authority is hereby given to the Board of Directors to transfer from the General Fund of the Company raised for the payment of losses and expenses, such sums from time to time as the Board of Directors may feel warranted in so transferring to said Emergency Fund, but that said Emergency Fund shall at no time exceed the sum of Fifteen Cents on each One Hundred Dollars of insurance based on the amount of insurance in force.

The Emergency Fund when so created shall be carried on the books of the Company as such, and may be drawn upon only as the Board of Directors of the Company shall determine it is necessary to pay losses and expenses, and when so drawn upon the amount so drawn from said Fund shall be replaced from the proceeds of the next regular assessment for losses and expenses, to the end that said Emergency Fund when created may be kept intact.

BY-LAWS

Article I. Corporate Powers

Section 1. Insurable Property. This Company may insure against direct loss or damage by tornado, cyclone or windstorm the following described classes of property owned by members and situate within the State of Michigan, namely, dwelling houses, stores, and all other kinds of buildings, household furniture, goods, wares and merchandise, and any other property subject to the terms and conditions of the articles of association and by-laws of the Company as they now exist and as they may hereafter be amended.

Section 2—Prohibited Risks. This Company shall not insure nor be liable for loss or damage to hay or grain in stacks, awnings on buildings, metal smokestacks, dilapidated buildings, single corncribs, uninclosed buildings, nor buildings not on a solid foundation. Provided, however, that metal smokestacks may be insured if they are well anchored and in good condition, and which are

a part of building or buildings covered by this policy, the amount of which policy shall be no less than 50 percent of the actual cash value of said building or buildings insured therein; and in no case shall metal smokestacks be protected on a policy of less than $50,000. Also it is provided that if the smokestacks on these buildings are not in use for one year, coverage on same shall cease until such a time as they are put in use again.

Section 3.—Limitation on Risks. This Company shall not insure woodstave silos or windmills, except when included in the same policy with other property at least ten times in value. It shall not be liable for damage to cupolas or barns or outbuildings, weather vanes, lightning rods, defective chimneys, roller doors not securely fastened at the bottom, signs or sign-boards, nor damage by hail except to window lights and good shingle roof. Provided, however, that the Company shall not be liable for damage to glass by hail on greenhouses, or for loss or damage to buildings while being repaired or rebuilt if the hazard is thereby increased. Any risk that is insured for One Hundred Thousand ($100,000.00) Dollars or over shall be inspected under the instruction of the President.

Section 4.—Limitation on Liability. The Company shall not be liable beyond the cash value of loss or damage at the time such loss or damage occurs. The liability for loss on any horse, mule or ass shall not exceed Three Hundred ($300.00) Dollars; on any cow, bull or steer not to exceed One Hundred and Fifty ($150.00) Dollars; on any sheep not to exceed Twenty-five ($25.00) Dollars; and on any hog not to exceed Fifty ($50.00) Dollars. The limit of liability on any windmill shall be One Hundred and Twenty-five ($125.00) Dollars, and on any woodstave silo not to exceed two-thirds of the actual damage or cost of repair; and in no case shall the company be liable for loss or damage to any woodstave silo that was empty and not filled the fall preceding the loss. The Company shall not be liable for loss or damage due to a falling building, smokestack or tree, unless such loss or damage be the direct or immediate result of a tornado, cyclone or windstorm. The Company shall not be liable for loss or damage under any policy unless such loss or damage amounts to Ten ($10.00) Dollars.

Section 5—Coverage While Off Insured Premises. Livestock, farm implements and vehicles otherwise included in policies are covered wherever situated within the State of Michigan, except while in transit by railroad or other common carrier, or in possession thereof for such transit. Hay, grain and farm produce may be insured and covered in any building insurable by this Company.

(Articles II to VII are omitted because they relate to the operation of the Company.)

ARTICLE VIII. POLICIES OF INSURANCE

Section 1. Applications. No policy shall be issued by the Company except upon an application in writing on form furnished by the Secretary-Treasurer and signed by the applicant, or his authorized agent, which said application shall be deemed to be a part of the policy, and any material misrepresentation therein shall void said policy.

Section 2.—Statement. No provision or condition contained in the articles of association, by-laws or application shall be held to be waived by the Company unless such waiver shall be in writing added thereto, nor shall any privilege or permission affecting the insurance thereunder exist or be claimed unless granted by rider attached thereto.

(Sections 3 to 12, inclusive are similar to provisions found in the standard fire policy relating to: notice of loss, adjustments, company option, when loss payable, suits, assignments, termination of liability, fraud and misrepresentation, pro-rating, and cancellation.)

Section 13.—Bridging the Cyclone-Fire Gap. This Company shall not be liable for any loss or damage caused by the neglect of the Insured to use all reasonable means to save and preserve the property during and after a windstorm, cyclone or tornado, nor for any loss or damage by fire, except in case the building or any material part thereof fall as a result of windstorm, cyclone or tornado immediately followed by fire as a direct result, then this insurance is extended to cover resultant fire loss; provided, however, that if there shall be other windstorm, cyclone or tornado insurance on said property, this Company shall be liable by virtue of this extension of liability for such portion only of such resultant fire loss as this Company's share of insurance bears to the total windstorm, cyclone or tornado insurance on such property, whether or not other insurance be valid or collectible.

The liability of this Company for loss or damage caused by windstorm, cyclone or tornado, including liability for resultant fire loss as provided and limited in this by-law, shall not exceed the amount of this policy against loss by windstorm, cyclone or tornado nor the interest of the insured in the property, and shall be subject in all other respects to the terms and conditions of this policy. Provided, however, that in the event of loss by fire resulting from windstorm, cyclone or tornado, and the Insured is protected by fire insurance against such loss, this Company shall not be liable for a fire loss as herein stated

APPENDIX "K"

TORNADO INTER-INSURANCE EXCHANGE
BRIDGE OPERATORS ENGINEERING AND INSPECTION BUREAU OF DULUTH, MINN.

Rules for Care of Bridges and Foundations

(Adopted April 4, 1930)

At Annual Meeting of Superintendents

1. No bridge or tower to be moved in any wind mileage exceeding 35 miles per hour.

2. Whether the bridge is equipt with automatic rail clamping devices or not, wooden blocks or steel chocks must be used. At least four blocks must be placed at each side of each rig after the wind has reached a velocity of 35 miles per hour. Adequate signals for both night and day, such as whistles and lights, must be used to insure the placing and removing of the blocks at the proper time.

3. Every bridge shall be equipt with cable guys, pawl anchorage or struts The fastening or anchoring of the guys to the ground to be in a manner approved by our engineer, who will also pass on the weight of cable required for the particular bridge. Cable guys, pawl anchorage or struts to be placed in wind mileage exceeding 35 miles per hour, and when bridges are not in operation.

4. The responsibility for placing wood chocks and tightening manual clamps, where ever used, to be definitely placed on men as part of regular duties.

5. It shall be the duty of the watchman coming on to the property at night to see first that the bridges are properly secured with devices with which they are equipt, and if not found to be properly secured, to fasten them, if possible. He shall then report the condition in which he finds the bridges to the superintendent, whether secured or the fact that certain devices were not applied.

6. A report on the 1st and 15th of each month to be made and signed by the superintendent as to

(a) Condition of solenoids,
(b) Report of tests of action of automatics and the condition of clamp shoes,
(c) Compliance with recommendations of inspector.

7. Signs to be placed on each end of each bridge, regardless of devices used, reading as follows:

WEDGES must be placed under WHEELS
All all times
When not operating
(Sign to be not less than 10x20 inches)

8. Rails and foundations to be of such construction as to positively hold the bridge through the application of clamps and cable guys, and also pass inspection of the Engineer.

9. On Docks where bolts are used for anchoring bridge rails, the nuts on such bolts must be removed at least once a year, and the threads properly lubricated before the nuts are replaced, to prevent corrosion and rust.

NOTE: Wherever the words "wind" or "wind velocity" are used herein they shall mean true velocity. Wherever the above Rules refer to wind velocity of 35 miles per hour, it is agreed that said limit shall be 40 miles per hour for structures with approved type of rack and pinion drive.

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